4

Financing Decisions

UNIT – I : COST OF CAPITAL

Learning Objectives

After studying this chapter you will be able to:

- Understand the concept of "Cost of Capital" that impacts the capital investments decisions for a business.
- Understand what are the different sources of capital (Debt, Equity Shares, Preference Shares etc.)?
- Understand what is the cost of employing each of these sources of capital?
- Know what is weighted average cost of capital (WACC) (overall cost of capital) for a business and also what is marginal cost of capital?
- Summarize how cost of capital is important in Financial Management?

Overview

This chapter covers the concept and significance of cost of capital, capital structure decisions and leverages. Cost of capital has relevance in almost every type of financial decision making. Leverages help in understanding what change in a firm's policy in terms of say increase or reduction in the number of units it is producing or whether the firm should rely more or less heavily on borrowed money, etc affect the risk and return scenario of the firm. The concept of financing mix has utility while deciding upon the hurdle rate for capital budgeting decisions under Chapter Six on Investment Decisions. Needless to say, this chapter too has applications in real life situations and requires thorough understanding of the concepts underlying each topic. Being a practically-oriented chapter, you need to practice a lot.

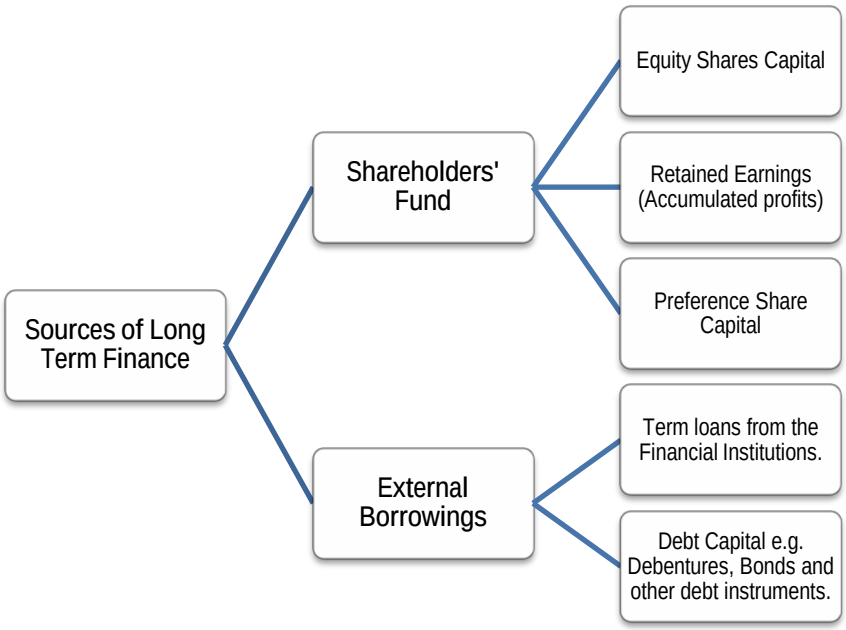
4.1 Introduction

In the previous chapter 'Time Value of Money', we learned the concept of discounting of the future cash flows to arrive at the present value of the future cash flows. Similarly, to know the future value of any given cash flows we used the technique of compounding. While applying

both discounting and compounding techniques we needed a rate (e.g. interest rate) to arrive at present value of future cashflows or future value of present cashflows. While doing so the discounting rate was generally given in the question. But to calculate the present value/ future value of cashflows when discount rate is not given, an appropriate discount rate needs to be calculated. In this chapter we will learn to find out appropriate rate for discounting/ compounding of cashflows. This rate of discount is popularly known as cost of capital.

The cost of capital i.e. cost of having capital for long period from different sources of finance. Generally the sources of finance for non corporate entity could be either internal (savings, investments in current and non-current assets etc.) or external borrowings (loan from financial institutions, local borrowings etc.).

The sources of finance for the corporate entities could be categorised into two part as below:



Shareholders' Fund: Shareholder' fund includes Equity Share Capital, Preference Share Capital, Retained earnings (accumulated profits).

External Borrowings: External borrowings includes long term loan from financial institutions, funds from issuance of debt instruments like Debentures, Bonds, any other debt instruments.

4.2 The Cost of Capital

When an entity (corporate or others) procured finances from either sources as listed above, it has to pay some additional amount of money besides the principal amount. The additional money paid to these financiers may be either one off payment or regular payment at specified intervals. This additional money paid is said to be the cost of using the capital and it is called the cost of capital. This cost of capital expressed in rate is used to discount/ compound the

cashflow or stream of cashflows. Cost of capital is also known as 'cut-off' rate, 'hurdle rate', 'minimum rate of return' etc.

4.3 Significance of the Cost of Capital

The cost of capital is important to arrive at correct amount and helps the management or an investor to take an appropriate decision. The correct cost of capital helps in the following decision making:

(i) Evaluation of investment options: The estimated benefits (future cashflows) from available investment opportunities (business or project) are converted into the present value of benefits by discounting them with the relevant cost of capital. Here it is pertinent to mention that every investment option may have different cost of capital hence it is very important to use the cost of capital which is relevant to the options available. Here Internal Rate of Return (IRR) is treated as cost of capital for evaluation of two options (projects).

(ii) Performance Appraisal: Cost of capital is used to appraise the performance of a particulars project or business. The performance of a project or business in compared against the cost of capital which is known here as cut-off rate or hurdle rate.

(iii) Designing of optimum credit policy: While appraising the credit period to be allowed to the customers, the cost of allowing credit period is compared against the benefit/ profit earned by providing credit to customer of segment of customers. Here cost of capital is used to arrive at the present value of cost and benefits received.

4.4 Determination of the Cost of Capital

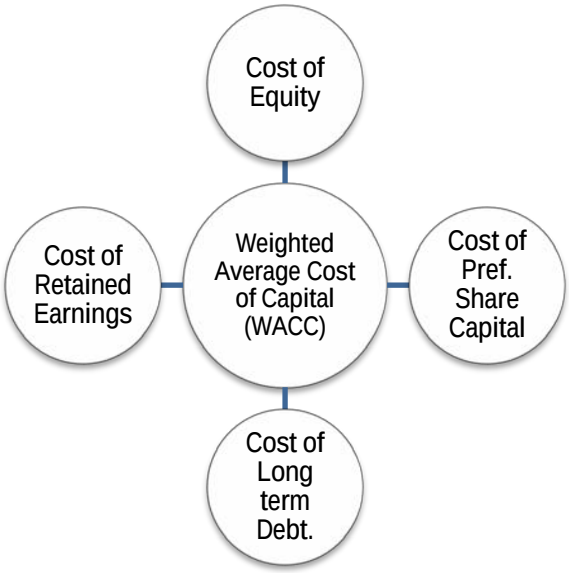
The cost of capital can either be explicit or implicit. The cash outflow of an entity towards the utilization of capital which is clear and obvious is termed as explicit cost of capital. These outflows may be interest payment to debenture holders, repayment of principal amount to financial institution or payment of dividend to shareholders etc. On the other hand Implicit cost is the cost which is actually not a cash outflow but it is an opportunity loss of foregoing a better investment opportunity by choosing an alternative option. An entrepreneur for example, uses its bank deposits which earns interest @ of 9% p.a. for the business purpose. Using its bank deposits for business purpose means forgoing interest earnings from the bank on this deposit. The cost of capital in this case will be 9% interest that could have been earned by not investing the deposit for the business purpose. This opportunity loss of 9% is called implicit cost capital or opportunity cost.

The two factors which is considered to determine the cost of capital are:

(i) Source of Finance

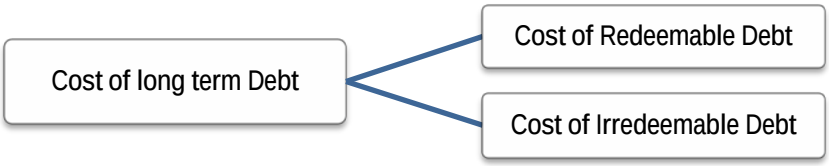
(ii) Reciprocal payment of the using finance.

We will discuss the cost of capital of each source of finance separately.



4.5 Cost of Long term Debt

External borrowings or debt instruments do not confers ownership to the providers of finance. The providers of the debt fund do not participate in the affairs of the company but enjoys the charge on the profit before taxes. Long term debt includes long term loans from the financial institutions, capital from issuing debentures or bonds etc. (In the next chapter we will discuss in detail about the sources of long term debt.). Based on redemption (repayment of principal) on maturity the debts can be categorised into two types (i) Redeemable debts and (ii) Irredeemable debts.



As discussed above the external borrowing or debt includes long term loan from financial institutions, issuance of debt instruments like debentures or bonds etc. The calculation of cost of loan from a financial institution is similar to that of redeemable debentures. Here we confine our discussion of cost debt to Debentures or Bonds only. The followings are the few features of debentures or bonds:

Face Value: Debentures or Bonds are denominated with some value; this denominated value is called face value of the debenture. Interest is calculated on the face value of the debentures. E.g. If a company issue 9% Non- convertible debentures of ₹ 100 each, this means the face value is ₹ 100 and the interest @ 9% will be calculated on this face value.

Interest (Coupon) Rate: Each debenture bears a fixed interest (coupon) rate (except Zero coupon bond and Deep discount bond).

Maturity period: Debentures or Bonds has a fixed maturity period for redemption.

Redemption: Debentures or Bonds are redeemed on its specified maturity date. Redemption value may vary from its face value.

Benefit of tax shield: The payment of interest to the debenture holders are allowed as expenses for the purpose of corporate tax determination. Hence, interest paid to the debenture holders save the tax liability of the company. Saving in the tax liability is also known as tax shield. The example given below will show you how interest paid by a company reduces the tax liability:

Example: There are two companies namely X Ltd. and Y Ltd. The capital of the X Ltd is fully financed by the shareholders whereas Y Ltd uses debt fund as well. The below is the profitability statement of both the companies:

	X Ltd. (₹ in lakh)	Y Ltd. (₹ in lakh)
Earnings before interest and taxes (EBIT)	100	100
Interest paid to debenture holders	-	(40)
Profit before tax (PBT)	100	60
Tax @ 35%	(35)	(21)
Profit after tax (PAT)	65	39

A comparison of the two companies shows that an interest payment of 40 by the Y Ltd. results in a tax shield (tax saving) of ₹14 lakh (₹ 40 lakh paid as interest × 35% tax rate). Therefore the effective interest is ₹ 26 lakh only.

4.5.1 Cost of Redeemable Debentures: The cost of redeemable debentures will be calculated as below:

$$K_d = \frac{I(1-t)+\frac{(RV-NP)}{N}}{\frac{(RV+NP)}{2}}$$

Where,

I = Interest payment

NP = Net proceeds from debentures or current market price.

RV = Redemption value of debentures

t = Tax rate

N = Life of debentures.

Illustration 1*: A company issued 10,000, 10% debentures of ₹ 100 each at a premium of 10% on 1.4.2013 to be matured on 1.4.2018. The debentures will be redeemed on maturity. Compute the cost of debentures assuming 35% as tax rate.*

Solution: The cost of debenture (K_d) will be calculated as below:

$$\text{Cost of debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{N}}{\frac{(RV+NP)}{2}}$$

I = Interest on debenture = 10% of ₹100 = ₹10

NP = Net Proceeds = 110% of ₹100 = ₹110

RV = Redemption value = ₹100

N = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹10(1-0.35)+\frac{(₹100-₹110)}{5\text{years}}}{\frac{(₹100+₹110)}{2}}$$

Or, $= \frac{₹10\times0.65-₹2}{₹105} = \frac{₹4.5}{₹105} = 0.0428$ or 4.28%

Illustration 2*: A company issued 10,000, 10% debentures of ₹ 100 each on 1.4.2013 to be matured on 1.4.2018. The company wants to know the current cost of its existing debt and the market price of the debentures is ₹ 80. Compute the cost of existing debentures assuming 35% tax rate.*

Solution:

$$\text{Cost of debenture } (K_d) = \frac{I(1-t)+\frac{(RV-NP)}{N}}{\frac{(RV+NP)}{2}}$$

I = Interest on debenture = 10% of ₹100 = ₹10

NP = Net Proceeds = ₹80

RV = Redemption value = ₹100

N = Period of debenture = 5 years

t = Tax rate = 35% or 0.35

$$K_d = \frac{₹10(1-0.35)+\frac{(₹100-₹80)}{5\text{years}}}{\frac{(₹100+₹80)}{2}}$$

Or, $= \frac{₹10\times0.65+₹4}{₹90} = \frac{₹10.5}{₹90} = 0.1166$ or 11.67%

4.5.1.1 Amortisation of Bond: A bond may be amortised every year i.e. principal is repaid every year rather than at maturity. In such a situation, the principal will go down with annual payments and interest will be computed on the outstanding amount. The cash flows of the bonds will be uneven.

The formula for determining the value of a bond or debenture that is amortised every year is as follows:

$$V_B = \frac{C_1}{(1+K_d)^1}+\frac{C_2}{(1+K_d)^2}+.....+\frac{C_n}{(1+K_d)^n}$$

$$V_B = \sum_{t=1}^{n}\frac{C_t}{(1+K_d)^t}$$

Illustration 3: *RBML is proposing to sell a 5-year bond of ₹ 5,000 at 8 per cent rate of interest per annum. The bond amount will be amortised equally over its life. What is the bond's present value for an investor if he expects a minimum rate of return of 6 per cent?*

Solution:

The amount of interest will go on declining as the outstanding amount of bond will be reducing due to amortisation. The amount of interest for five years will be:

First year: ₹5,000 × 0.08 = ₹ 400;

Second year: (₹5,000 – ₹1,000) × 0.08 = ₹ 320;

Third year: (₹4,000 – ₹1,000) × 0.08 = ₹ 240;

Fourth year: (₹3,000 – ₹1,000) × 0.08 = ₹ 160; and

Fifth year: (₹2,000– ₹1,000) × 0.08 = ₹ 80.

The outstanding amount of bond will be zero at the end of fifth year.

Since RBML will have to return ₹1,000 every year, the outflows every year will consist of interest payment and repayment of principal:

First year: ₹1,000 + ₹ 400 = ₹1,400;

Second year: ₹1,000 + ₹ 320 = ₹1,320;

Third year: ₹1,000 + ₹ 240 = ₹1,240;

Fourth year: ₹1,000 + ₹ 160 = ₹1,160; and

Fifth year: ₹1,000 + ₹80 = ₹ 1,080.

The above cash flows of all five years will be discounted with the cost of capital. Here the expected rate i.e. 6% will be used.

Value of the bond is calculated as follows:

$$V_B = \frac{₹1,400}{(1.06)^1} + \frac{₹1,320}{(1.06)^2} + \frac{₹1,240}{(1.06)^3} + \frac{₹1,160}{(1.06)^4} + \frac{₹1,080}{(1.06)^5}$$

$$= \frac{₹1,400}{1.06} + \frac{₹1,320}{1.1236} + \frac{₹1,240}{1.1910} + \frac{₹1,160}{1.2624} + \frac{₹1,080}{1.3382}$$

= ₹1,320.75 + ₹1,174.80 + ₹1,041.14 + ₹918.88 + ₹807.05 = ₹ 5,262.62

4.5.2 Cost of Irredeemable Debentures: The cost of debentures which are not redeemed by the issuer of the debenture is known as irredeemable debentures. Cost of debentures not redeemable during the life time of the company is calculated as below:

$$K_d = \frac{I}{NP}(1-t)$$

Where,

K_d = Cost of debt after tax

I = Annual interest payment

NP = Net proceeds of debentures or current market price

t = Tax rate

Note: Though issuance of irredeemable debentures may not be allowed in some countries but for the academic knowledge it is studied here.

Suppose a company issues 1,000, 15% debentures of the face value of ₹100 each at a discount of ₹5. Suppose further, that the under-writing and other costs are ₹ 5,000/- for the total issue. Thus ₹ 90,000 is actually realised, i.e., ₹ 1,00,000 minus ₹ 5,000 as discount and ₹ 5,000 as under-writing expenses. The interest per annum of ₹ 15,000 is therefore the cost of ₹ 90,000, actually received by the company. This is because interest is a charge on profit and every year the company will save ₹ 7,500 as tax, assuming that the income tax rate is 50%. Hence the after tax cost of ₹ 90,000 is ₹ 7,500 which comes to 8.33%.

Illustration 4: *Five years ago, Sona Limited issued 12 per cent irredeemable debentures at ₹ 103, a ₹ 3 premium to their par value of ₹ 100. The current market price of these debentures is ₹ 94. If the company pays corporate tax at a rate of 35 per cent what is its current cost of debenture capital?*

Solution:

Cost of irredeemable debenture:

$$K_d = \frac{I}{NP}(1-t)$$

$$K_d = \frac{₹12}{₹94}(1-0.35) = 0.08297 \text{ or } 8.30\%$$

4.5.3 Cost of Convertible Debenture:

Holders of the convertibel debentures has the option to either get the debentures redeemed into the cash or get specified numbers of companies shares in leiu of cash. Cost of convertible debentures are very much similar to the redeemable debentures. When the debenture holders decide to get their debentures converted into the shares, estimated value of shares on the date of maturity becomes the redeemable value such debentures. For the sake of simplicity we assume that all debenture holders will be opting the same option i.e. either cash or shares.

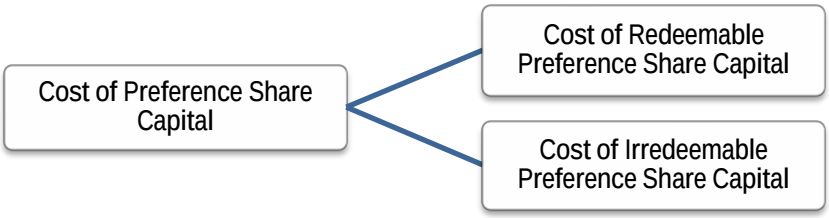
$$K_d = \frac{I(1-t)+\frac{(RV-NP)}{N}}{\frac{(RV+NP)}{2}}$$

Where,

I	=	Interest payment
NP	=	Current market value of the shares.
RV	=	Redemption value of debentures
t	=	Tax rate
N	=	Life of debentures.

4.6 Cost of Preference Share Capital

The preference share capital is paid dividend at a specified rate on face value of preference shares. Payment of dividend to the preference shareholders are not mandatory but are given priority over the equity shareholder. The payment of dividend to the preference share holders are not charged as expenses but treated as appropriation of after tax profit. Hence, dividend paid to preference share holders does not reduce the tax liability to the company. Like the debentures, Preference share capital can be categorised as redeemable and irredeemable. Accordingly cost of capital for each type will be discussed here.



4.6.1 Cost of Redeemable Preference Shares: Preference shares issued by a company which are redeemed on its maturity is called redeemable preference shares. Cost of redeemable preference share is similar to the cost of redeemable debentures with the exception that the dividends paid to the preference shareholders are not tax deductible. Cost of preference capital is calculated as follows:

$$K_p = \frac{PD + (RV - NP)/N}{\frac{RV + NP}{2}}$$

Where,

PD = Annual preference dividend
RV = Redemption value of preference shares
NP = Net proceeds on issue of preference shares
N = Life of preference shares.

The cost of redeemable preference share could also be calculated as the discount rate that equates the net proceeds of the sale of preference shares with the present value of the future dividends and principal payments.

Illustration 5*: XYZ Ltd. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. The company proposes to redeem the preference shares at the end of 10th year from the date of issue. Calculate the cost of preference share?*

Solution:

$$K_p = \frac{PD + (RV - NP)/N}{\frac{RV + NP}{2}}$$

$$K_p = \frac{10 + \left(\frac{100 - 95}{10}\right)}{\left(\frac{100 + 95}{2}\right)} = 0.1077 \text{ (approx.)} = 10.77\%$$

4.6.2 Cost of Irredeemable Preference Shares: The cost of irredeemable preference shares is similar to calculation of perpetuity. The cost is calculated by dividing the preference dividend with the current market price or net proceeds from the issue. The cost of irredeemable preference share is as below:

$$K_P = \frac{PD}{P_0}$$

Where,

PD = Annual preference dividend

P_0 = Net proceeds in issue of preference shares.

Note: As per the Companies Act 2013, issuances of irredeemable preference shares are not allowed but for the academic knowledge it is studied here.

Illustration 6: *XYZ & Co. issues 2,000 10% preference shares of ₹ 100 each at ₹ 95 each. Calculate the cost of preference shares.*

Solution:

$$K_P = \frac{PD}{P_0}$$

$$K_p = \frac{(10 \times 2{,}000)}{(95 \times 2{,}000)} = \frac{10}{95} = 0.1053 = 10.53\%$$

Illustration 7: *If R Energy is issuing preferred stock at ₹100 per share, with a stated dividend of ₹12, and a floatation cost of 3% then, what is the cost of preference share?*

Solution:

$$K_p = \frac{\text{Preferred stock dividend}}{\text{Market price of preferred stock}(1 - \text{floatation cost})}$$

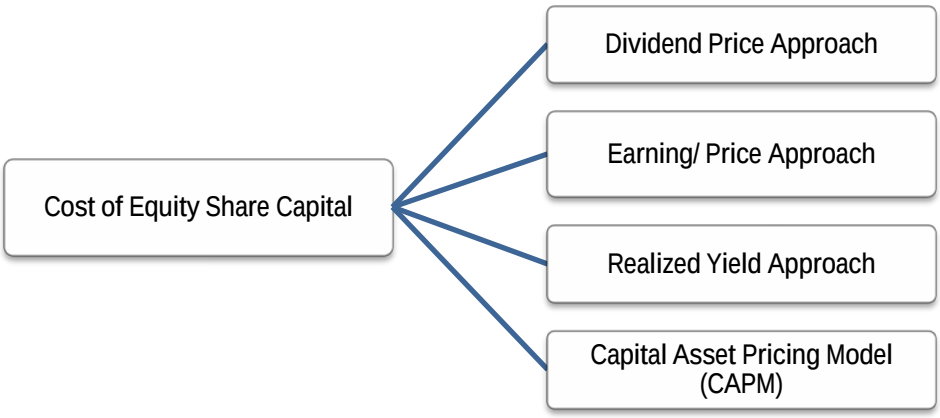
$$= \frac{₹12}{₹100(1-0.03)} = \frac{₹12}{₹97} = 0.1237 \text{ or } 12.37\%$$

4.7 Cost of Equity Share Capital

It may prima facie appear that equity capital does not carry any cost. But this is not true. The market share price is a function of return that equity shareholders expect and get. If the company does not meet their requirements, it will have an adverse effect on the market share price. Also, it is relatively the highest cost of capital. Due to relative higher risk, equity shareholders expect higher return hence, the cost of capital is also high.

In simple words, cost of equity capital is the rate of return which equates the present value of expected dividends with the market share price. In theory, the management strives to maximize the position of equity holders and the effort involves many decisions.

Different methods are employed to compute the cost of equity share capital.



4.7.1 Dividend Price Approach: Here, cost of equity capital is computed by dividing the current dividend by average market price per share. However, this method cannot be used to calculate cost of equity of units suffering losses. This dividend price ratio expresses the cost of equity capital in relation to what yield the company should pay to attract investors. It is used to estimate the cost of companies having no-growth or zero-growth.

$$K_e = \frac{D_1}{P_0}$$

Where,

K_e = Cost of equity

D_1 = Annual dividend

P_0 = Market value of equity (ex- dividend)

This model assumes that dividends are paid at a constant rate to perpetuity. It ignores taxation.

Earnings and dividends do not remain constant and the price of equity shares is also directly influenced by the growth rate in dividends. Where earnings, dividends and equity share price all grow at the same rate, the cost of equity capital may be computed as follows:

$$K_e = \frac{D_1}{P_0} + G$$

Where,

D_1 = $[D_0 (1+ G)]$ i.e. next expected dividend

P_0 = Current Market price per share

G = Constant Growth Rate of Dividend.

In case of newly issued equity shares where floatation cost is incurred, the cost of equity share with an estimation of constant dividend growth is calculated as below:

$$K_e = \frac{D_1}{P_0 - F} + G$$

Where,

F = Amount of flotation cost per share

Illustration 8: *A company has paid dividend of ₹ 1 per share (of face value of ₹ 10 each) last year and it is expected to grow @ 10% next year. Calculate the cost of equity if the market price of share is ₹ 55.*

Solution:

$$K_e = \frac{D_1}{P_0} + G = \frac{1(1+.10)}{55} + .10 = 0.12 = 12\%$$

4.7.2 Earning/ Price Approach: The advocates of this approach co-relate the earnings of the company with the market price of its share. Accordingly, the cost of ordinary share capital would be based upon the expected rate of earnings of a company. The argument is that each investor expects a certain amount of earnings, whether distributed or not from the company in whose shares he invests. Thus, if an investor expects that the company in which he is going to subscribe for shares should have at least a 20% rate of earning, the cost of equity share capital can be construed on this basis. Suppose the company is expected to earn 30% the investor will be prepared to pay ₹ 150 $\left(₹ \frac{30}{20} \times 100\right)$ for each share of ₹ 100.

So, cost of equity will be given by:

$$K_e = \frac{E}{P}$$

Where,

E = Current earnings per share
P = Market share price

Since practically earnings do not remain constant and the price of equity shares is also directly influenced by the growth rate in earning, we need to modify the above calculation with an element of growth.

So, cost of equity will be given by:

$$K_e = \frac{E}{P} + G$$

Where,

E = Current earnings per share
P = Market share price
G = Annual growth rate of earnings.

The calculation of 'G' (the growth rate) is an important factor in calculating cost of equity capital. The past trend in earnings and dividends may be used as an approximation to predict the future growth rate if the growth rate of dividend is fairly stable in the past.

$G = 1.0\ (1+G)^n$ where n is the number of years

The Earning Price Approach is similar to the dividend price approach; only it seeks to nullify the effect of changes in the dividend policy.

4.7.3 Realized Yield Approach: According to this approach, the average rate of return realized in the past few years is historically regarded as 'expected return' in the future. It computes cost of equity based on the past records of dividends actually realised by the equity shareholders. The yield of equity for the year is:

$$Y_t = \frac{D_t + P_{t-1}}{P_{t-1}}$$

Where,

Y_t = Yield for the year t

D_t = Dividend per share at the end of the year t

P_t = Price per share at the end of the year t

P_{t-1} = Price per share at the beginning and at the end of the year t

Though, this approach provides a single mechanism of calculating cost of equity, it has unrealistic assumptions like risks faced by the company remain same; the shareholders continue to expect the same rate of return; and the reinvestment opportunity cost (rate) of the shareholders is same as the realised yield. If the earnings do not remain stable, this method is not practical.

Illustration 9

Mr. Mehra had purchased a share of Alpha Limited for ₹ 1,000. He received dividend for a period of five years at the rate of 10 percent. At the end of the fifth year, he sold the share of Alpha Limited for ₹ 1,128. You are required to compute the cost of equity as per realised yield approach.

Solution:

We know that as per the realised yield approach, cost of equity is equal to the realised rate of return. Therefore, it is important to compute the internal rate of return by trial and error method. This realised rate of return is the discount rate which equates the present value of the dividends received in the past five years plus the present value of sale price of ₹ 1,128 to the purchase price of ₹1,000. The discount rate which equalises these two is 12 percent approximately. Let us look at the table given for a better understanding:

Year	Dividend (₹)	Sale Proceeds (₹)	Discount Factor @ 12%	Present Value (₹)
1	100	-	0.893	89.3

2	100	-	0.797	79.7
3	100	-	0.712	71.2
4	100	-	0.636	63.6
5	100	-	0.567	56.7
6	Beginning	1,128	0.567	639.576
				1,000.076

We find that the purchase price of Alpha limited's share was ₹ 1,000 and the present value of the past five years of dividends plus the present value of the sale price at the discount rate of 12 percent is ₹1,000.076. Therefore, the realised rate of return may be taken as 12 percent. This 12 percent is the cost of equity.

4.7.4 Capital Asset Pricing Model (CAPM) Approach: CAPM model describes the risk-return trade-off for securities. It describes the linear relationship between risk and return for securities.

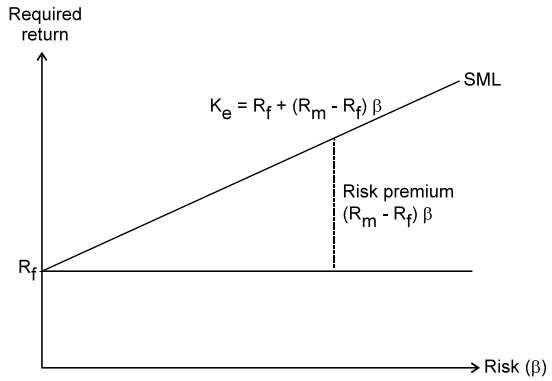
The risks, to which a security is exposed, can be classified into two groups:

(i) Unsystematic Risk: This is also called company specific risk as the risk is related with the company's performance. This type of risk can be reduced or eliminated by diversification of the securities portfolio. This is also known as diversifiable risk.

(ii) Systematic Risk: It is the macro- economic or market specific risk under which a company operates. This type of risk cannot be eliminated by the diversification hence, it is non-diversifiable. The examples are inflation, Government policy, interest rate etc.

As diversifiable risk can be eliminated by an investor through diversification, the non-diversifiable risk is the risk which cannot be eliminated; therefore a business should be concerned as per CAPM method, solely with non-diversifiable risk.

The non-diversifiable risks are assessed in terms of beta coefficient (b or β) through fitting regression equation between return of a security and the return on a market portfolio.



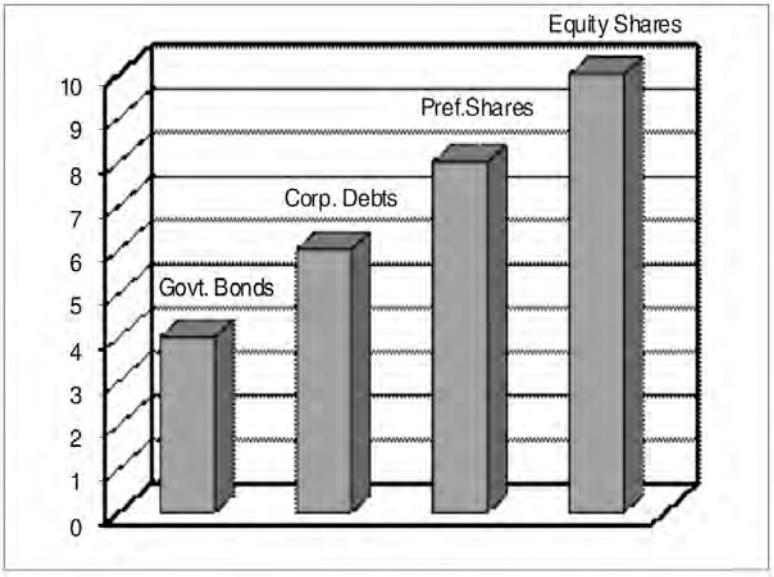
Cost of Equity under CAPM

Thus, the cost of equity capital can be calculated under this approach as:

$$K_e = R_f + ß\ (R_m - R_f)$$

Where,

K_e	=	Cost of equity capital
R_f	=	Rate of return on security
ß	=	Beta coefficient
R_m	=	Rate of return on market portfolio
$(R_m - R_f)$	=	Market premium



Risk Return relationship of various securities

Therefore, Required rate of return = Risk free rate + Risk premium

The idea behind CAPM is that investors need to be compensated in two ways- time value of money and risk.

- The time value of money is represented by the risk-free rate in the formula and compensates the investors for placing money in any investment over a period of time.
- The other half of the formula represents risk and calculates the amount of compensation the investor needs for taking on additional risk. This is calculated by taking a risk measure (beta) which compares the returns of the asset to the market over a period of time and compares it to the market premium.

The CAPM says that the expected return of a security or a portfolio equals the rate on a risk-free security plus a risk premium. If this expected return does not meet or beat the required return, then the investment should not be undertaken.

The shortcomings of this approach are:

(a) Estimation of betas with historical data is unrealistic; and

(b) Market imperfections may lead investors to unsystematic risk.

Despite these shortcomings, the capital asset pricing approach is useful in calculating cost of equity, even when the firm is suffering losses.

The basic factor behind determining the cost of ordinary share capital is to measure the expectation of investors from the ordinary shares of that particular company. Therefore, the whole question of determining the cost of ordinary shares hinges upon the factors which go into the expectations of particular group of investors in a company of a particular risk class.

Illustration 10: *Calculate the cost of equity capital of H Ltd., whose risk free rate of return equals 10%. The firm's beta equals 1.75 and the return on the market portfolio equals to 15%.*

Solution:

$K_e = R_f + ß (R_m - R_f)$

$K_e = 0.10 + 1.75 (0.15 - 0.10)$

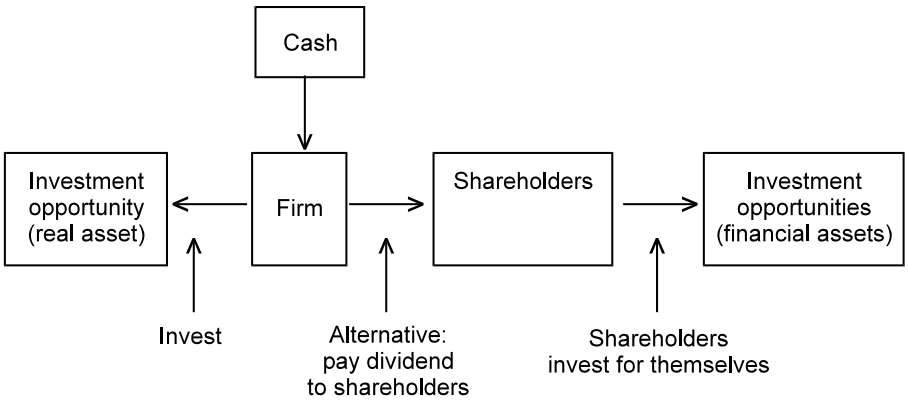
$= 0.10 + 1.75 (0.05)$

$= 0.1875$ or 18.75%

4.8 Cost of Retained Earnings

Like another source of fund, retained earnings involve cost. It is the opportunity cost of dividends foregone by shareholders.

The given figure depicts how a company can either keep or reinvest cash or return it to the shareholders as dividends. (Arrows represent possible cash flows or transfers.) If the cash is reinvested, the opportunity cost is the expected rate of return that shareholders could have obtained by investing in financial assets.



Cost of Retained Earnings

There are two approaches to measure this opportunity cost. One approach is by using discounted cash flow (DCF) method and the second approach is by using capital asset pricing model.

(a) *By DCF* : $K_s = \frac{D_1}{P_0} + G$

Where,

D_1 = Dividend

P_0 = Current market price

G = Growth rate.

(b) *By CAPM* : $K_s = R_f + ß\ (R_m - R_f)$

Where,

K_s = Cost of equity capital

R_f = Rate of return on security

ß = Beta coefficient

R_m = Rate of return on market portfolio

$(R_m - R_f)$ = Market premium

Illustration 11: *ABC Company provides the following details:*

D_0 = ₹ 4.19 P_0 = ₹ 50 G = 5%

Calculate the cost of retained earnings based on DCF method.

Solution:

$$K_s = \frac{D_1}{P_0} + G = \frac{D_0(1+G)}{P_0} + G$$

$$= \frac{₹\ 4.19\ (1.05)}{₹\ 50} + 0.05$$

$$= 0.088 + 0.05 = 13.8\%$$

Illustration 12: *ABC Company provides the following details:*

R_f = 7% ß = 1.20 R_M - R_f = 6%

Calculate the cost of retained earnings based on CAPM method.

Solution:

$K_s = R_f + ß\ (R_M - R_f)$

$= 7\% + 1.20\ (6\%)$

$= 7\% + 7.20$

$K_s = 14.2\%$

4.9 Weighted Average Cost of Capital (WACC)

WACC is also known as the overall cost of capital of having capitals from the different sources as explained above. WACC of a company depends on the capital structure of a company. It weighs the cost of capital of a particular source of capital with its proportion to the total capital. The weighted average cost of capital for a firm is of use in two major areas:-

1. In consideration of the firm's position;
2. Evaluation of proposed changes necessitating a change in the firm's capital. Thus, a weighted average technique may be used in a quasi-marginal way to evaluate a proposed investment project, such as the construction of a new building.

Thus, weighted average cost of capital is the weighted average after tax costs of the individual components of firm's capital structure. That is, the after tax cost of each debt and equity is calculated separately and added together to a single overall cost of capital.

The steps to calculate WACC is as follows:

Step 1: Calculated the total capital from all the sources.

(i.e. Long term debt capital + Pref. Share Capital + Equity Share Capital + Retained Earnings)

Step 2: Calculated the proportion (or %) of each source of capital to the total capital.

(i.e. $\frac{\text{Equity Share Capital (for example)}}{\text{Total Capital (as calculated in Step 1 above)}}$)

Step 3: Multiply the proportion as calculated in Step 2 above with the respective cost of capital.

(i.e. K_e × Proportion (%) of equity share capital (for example) calculated in Step 2 above)

Step 4: Aggregate the cost of capital as calculated in Step 3 above. This is the WACC.

(i.e. $K_e + K_d + K_p + K_s$ as calculated in Step 3 above)

Example:

Calculation of WACC

Capital Component	Cost of capital	% of total capital structure	Total
Retained Earnings	10%	25%	2.50%
Equity Share Capital	11%	10%	1.10%
Preference Share Capital	9%	15%	1.35%
Long term debts	6%	50%	3.00%
Total (WACC)			7.95%

The cost of weighted average method is preferred because the proportions of various sources of funds in the capital structure are different. To be representative, therefore, cost of capital

should take into account the relative proportions of different sources of finance.

Securities analysts employ WACC all the time when valuing and selecting investments. In discounted cash flow analysis, WACC is used as the discount rate applied to future cash flows for deriving a business's net present value. WACC can be used as a hurdle rate against which to assess return on investment capital performance. Investors use WACC as a tool to decide whether or not to invest. The WACC represents the minimum rate of return at which a company produces value for its investors. Let's say a company produces a return of 20% and has a WACC of 11%. By contrast, if the company's return is less than WACC, the company is shedding value, which indicates that investors should put their money elsewhere.

Therefore, WACC serves as a useful reality check for investors.

But there are problems in determination of weighted average cost of capital. These mainly relate to:-

1. Computation of equity capital and;
2. Assignment of weights to the cost of specific source of financing. Assignment of weights can be possible either on the basis of historical weighting or marginal weighting.

Historical Weighting:- The basis here is the funds already employed by the firm. This basis is based on the assumption that the business's existing capital structure is optimal and therefore should be maintained in the future. In historical weighting, there is a choice between the book value weights and market value weights. While the book value weights may be operationally convenient, the market value basis is theoretically more consistent, sound and a better indicator of firm's capital structure. The desirable practice is to employ market weights to compute the firm's cost of capital. This rationale rests on the fact that the cost of capital measures the cost of issuing securities – stocks as well as bonds – to finance projects, and that these securities are issued at market value, not at book value.

Illustration 13: *Calculate the WACC using the following data by using:*

(a) Book value weights

(b) Market value weights

The capital structure of the company is as under:

	(₹)
Debentures (₹ 100 per debenture)	*5,00,000*
Preference shares (₹ 100 per share)	*5,00,000*
Equity shares (₹ 10 per share)	*10,00,000*
	20,00,000

The market prices of these securities are:

Debentures ₹ 105 per debenture

Preference shares *₹ 110 per preference share*

Equity shares *₹ 24 each.*

Additional information:

(1) *₹ 100 per debenture redeemable at par, 10% coupon rate, 4% floatation costs, 10 year maturity.*

(2) *₹ 100 per preference share redeemable at par, 5% coupon rate, 2% floatation cost and 10 year maturity.*

(3) *Equity shares has ₹ 4 floatation cost and market price ₹ 24 per share.*

The next year expected dividend is ₹ 1 with annual growth of 5%. The firm has practice of paying all earnings in the form of dividend.

Corporate tax rate is 50%.

Solution:

$$\text{Cost of equity} = K_e = \frac{1}{20} + 0.05 = 0.05 + 0.05 = 0.10$$

$$\text{Cost of debt} = K_d = \frac{10(1 - 0.5) + \frac{(100 - 96)}{10}}{\frac{(100 + 96)}{2}} = \left(\frac{5 + 0.4}{196}\right) \times 2 = 0.055 \text{ (approx.)}$$

$$\text{Cost of preference shares} = K_p = \left(\frac{5 + \frac{2}{10}}{\frac{198}{2}}\right) = \left(\frac{5.2}{99}\right) = 0.053 \text{ (approx.)}$$

Calculation of WACC using book value weights

Source of capital	Book Value	Specific cost (K)	Total cost
10% Debentures	5,00,000	0.055	27,500
5% Preference shares	5,00,000	0.053	26,500
Equity shares	10,00,000	0.10	1,00,000
	20,00,000		1,54,000

$$K_0 = \frac{₹\ 1{,}54{,}000}{₹\ 20{,}00{,}000} = 0.077 \text{ (approx.)}$$

Calculation of WACC using market value weights

Source of capital	Market Value	Specific cost (K)	Total cost
10% Debentures	5,25,000	0.055	28,875

5% Preference shares	5,50,000	0.053	29,150
Equity shares	24,00,000	0.10	2,40,000
	34,75,000		2,98,025

$$K_0 = \frac{₹\ 2,98,025}{₹\ 34,75,000} = 0.08576 \text{ (approx.)}$$

Illustration 14: *Determine the cost of capital of Best Luck Limited using the book value (BV) and market value (MV) weights from the following information:*

Sources	*Book Value*	*Market Value*
	(₹)	*(₹)*
Equity shares	*1,20,00,000*	*2,00,00,000*
Retained earnings	*30,00,000*	*—*
Preference shares	*9,00,000*	*10,40,000*
Debentures	*36,00,000*	*33,75,000*

Additional information :

I. Equity: Equity shares are quoted at ₹ 130 per share and a new issue priced at ₹ 125 per share will be fully subscribed; flotation costs will be ₹ 5 per share.

II. Dividend: During the previous 5 years, dividends have steadily increased from ₹ 10.60 to ₹ 14.19 per share. Dividend at the end of the current year is expected to be ₹ 15 per share.

III. Preference shares: 15% Preference shares with face value of ₹ 100 would realise ₹ 105 per share.

IV. Debentures: The company proposes to issue 11-year 15% debentures but the yield on debentures of similar maturity and risk class is 16% ; flotation cost is 2%.

V. Tax: Corporate tax rate is 35%. Ignore dividend tax.

Solution:

(i) Cost of Equity (K_e) = $\frac{D_1}{P_0 - F} + G = \frac{₹15}{₹125 - ₹5} + 0.06$ (refer to working note)

Ke = 0.125 + 0.06 = 0.185

Working Note: Calculation of G

₹ $10.6(1+r)^5$ = ₹ 14.19 (or ₹ 1 compounds to ₹ 1.338)

Or ₹10.6 × FVIF (i, 5 years)

Table (FVIF) suggests that ₹1 compounds to ₹1.338 in 5 years at the compound rate of 6 percent. Therefore, G is 6 per cent.

(ii) Cost of Retained Earnings (K_s) = $\frac{D_1}{P_0} + G = \frac{₹15}{₹125} + 0.06 = 0.18$

(iii) Cost of Preference Shares (K_p) = $\frac{PD}{P_0} = \frac{₹15}{₹105} = 0.1429$

(iv) Cost of Debentures (K_d) = $\frac{I(1-t) + \left(\frac{RV - NV}{N}\right)}{\frac{RV + NV}{2}} = \frac{₹15(1-0.35) + \left(\frac{₹100 - ₹91.75*}{11 \text{years}}\right)}{\frac{₹100 + ₹91.75*}{2}}$

$= \frac{₹15 \times 0.65 + ₹0.75}{₹95.875} = \frac{₹10.5}{₹95.875} = 0.1095$

*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

Market price of debentures = Coupon rate ÷ Market rate of interest = ₹ 15 ÷ 0.16 = ₹ 93.75

Sale proceeds from debentures = ₹93.75 – ₹ 2 (i.e., floatation cost) = ₹91.75

Cost of capital [BV weights and MV weights] (amount in lakh of rupees)

Source of capital	Weights		Specific Cost (K)	Total cost	
	BV	MV		(BV × K)	(MV × K)
Equity Shares	120	160*	0.1850	22.2	29.6
Retained Earnings	30	40*	0.1800	5.4	7.2
Preference Shares	9	10.4	0.1429	1.29	1.49
Debentures	36	33.75	0.1095	3.94	3.70
Total	195	244.15		32.83	41.99

*Market Value of equity has been apportioned in the ratio of Book Value of equity and retained earnings

Weighted Average Cost of Capital (WACC):

Using Book Value = $\frac{₹32.83}{₹195}$ =0.1684 or 16.84%

Using Market Value = $\frac{₹41.99}{₹244.15}$ = 0.172 or 17.2%

4.10 Marginal Cost of Capital

The marginal cost of capital may be defined as the cost of raising an additional rupee of capital.

Since the capital is raised in substantial amount in practice, marginal cost is referred to as the cost incurred in raising new funds. Marginal cost of capital is derived, when the average cost of capital is calculated using the marginal weights.

The marginal weights represent the proportion of funds the firm intends to employ. Thus, the problem of choosing between the book value weights and the market value weights does not arise in the case of marginal cost of capital computation.

To calculate the marginal cost of capital, the intended financing proportion should be applied as weights to marginal component costs. The marginal cost of capital should, therefore, be calculated in the composite sense. When a firm raises funds in proportional manner and the component's cost remains unchanged, there will be no difference between average cost of capital (of the total funds) and the marginal cost of capital. The component costs may remain constant upto certain level of funds raised and then start increasing with amount of funds raised.

For example, the cost of debt may remain 7% (after tax) till ₹10 lakhs of debt is raised, between ₹10 lakhs and ₹15 lakhs, the cost may be 8% and so on. Similarly, if the firm has to use the external equity when the retained profits are not sufficient, the cost of equity will be higher because of the floatation costs. When the components cost start rising, the average cost of capital will rise and the marginal cost of capital will however, rise at a faster rate.

Illustration 15: *ABC Ltd. has the following capital structure which is considered to be optimum as on 31st March, 2013.*

	(₹)
14% Debentures	*30,000*
11% Preference shares	*10,000*
Equity Shares (10,000 shares)	*1,60,000*
	2,00,000

The company share has a market price of ₹ 23.60. Next year dividend per share is 50% of year 2013 EPS. The following is the trend of EPS for the preceding 10 years which is expected to continue in future.

Year	*EPS (₹)*	*Year*	*EPS ₹)*
2004	*1.00*	*2009*	*1.61*
2005	*1.10*	*2010*	*1.77*
2006	*1.21*	*2011*	*1.95*
2007	*1.33*	*2012*	*2.15*
2008	*1.46*	*2013*	*2.36*

The company issued new debentures carrying 16% rate of interest and the current market price of debenture is ₹ 96.

Preference share ₹ 9.20 (with annual dividend of ₹ 1.1 per share) were also issued. The company is in 50% tax bracket.

(A) Calculate after tax:

(i) Cost of new debt

(ii) Cost of new preference shares

(iii) New equity share (consuming new equity from retained earnings)

(B) Calculate marginal cost of capital when no new shares are issued.

(C) How much can be spent for capital investment before new ordinary shares must be sold. Assuming that retained earnings for next year's investment are 50 percent of 2013.

(D) What will the marginal cost of capital when the funds exceeds the amount calculated in (C), assuming new equity is issued at ₹ 20 per share?

Solution:

(A) (i) Cost of new debt

$$K_d = \frac{I(1-t)}{P_0}$$

$$= \frac{16\ (1\ -0.5)}{96} = 0.0833$$

(ii) Cost of new preference shares

$$K_p = \frac{PD}{P_0}$$

$$= \frac{1.1}{9.2} = 0.12$$

(iii) Cost of new equity shares

$$K_e = \frac{D_1}{P_0} + G$$

$$= \frac{1.18}{23.60} + 0.10 = 0.05 + 0.10 = 0.15$$

Calculation of D_1

D_1 = 50% of 2013 EPS = 50% of 2.36 = ₹ 1.18

(B)

Type of Capital	Proportion	Specific Cost	Product
(1)	(2)	(3)	(2) × (3) = (4)
Debenture	0.15	0.0833	0.0125
Preference Share	0.05	0.12	0.0060

Equity Share	0.80	0.15	0.1200
	Marginal cost of capital		0.1385

(C) The company can spend the following amount without increasing marginal cost of capital and without selling the new shares:

Retained earnings = (0.50) (2.36 × 10,000) = ₹ 11,800

The ordinary equity (Retained earnings in this case) is 80% of total capital

11,800 = 80% of Total Capital

$$\therefore \text{ Capital investment before issuing equity } = \frac{₹\ 11{,}800}{0.80} = ₹\ 14{,}750$$

(D) If the company spends in excess of ₹ 14,750 it will have to issue new shares.

The cost of new issue will be

$$= \frac{₹\ 1.18}{20} + 0.10 = 0.159$$

The marginal cost of capital will be:

Type of Capital	Proportion	Specific Cost	Product
(1)	(2)	(3)	(2) × (3) = (4)
Debentures	0.15	0.0833	0.0125
Preference Shares	0.05	0.1200	0.0060
Equity Shares (New)	0.80	0.1590	0.1272
			0.1457

Illustration 16*: Gamma Limited has in issue 5,00,000 ₹ 1 ordinary shares whose current ex-dividend market price is ₹ 1.50 per share. The company has just paid a dividend of 27 paise per share, and dividends are expected to continue at this level for some time. If the company has no debt capital, what is the weighted average cost of capital?*

Solution:

Market value of equity, E = 5,00,000 shares × ₹1.50 = ₹7,50,000

Market value of debt, D = Nil

Cost of equity capital, $K_e = \frac{D_1}{P_0} = \frac{₹0.27}{₹1.50} = 0.18$

Since there is no debt capital, WACC = K_e = 18 per cent.

Illustration 17*: Masco Limited wishes to raise additional finance of ₹ 10 lakhs for meeting its investment plans. It has ₹ 2,10,000 in the form of retained earnings available for investment purposes. Further details are as following:*

(1)	*Debt / equity mix*	*30%/70%*
(2)	*Cost of debt*	
	Upto ₹ 1,80,000	*10% (before tax)*
	Beyond ₹ 1,80,000	*16% (before tax)*
(3)	*Earnings per share*	*₹ 4*
(4)	*Dividend pay out*	*50% of earnings*
(5)	*Expected growth rate in dividend*	*10%*
(6)	*Current market price per share*	*₹ 44*
(7)	*Tax rate*	*50%*

You are required:

(a) To determine the pattern for raising the additional finance.

(b) To determine the post-tax average cost of additional debt.

(c) To determine the cost of retained earnings and cost of equity, and

(d) Compute the overall weighted average after tax cost of additional finance.

Solution:

(a) Pattern of raising additional finance

Equity	70% of ₹ 10,00,000	= ₹ 7,00,000
Debt	30% of ₹ 10,00,000	= ₹ 3,00,000

The capital structure after raising additional finance:

		(₹)
Shareholders' funds		
Equity Capital	(7,00,000–2,10,000)	4,90,000
Retained earnings		2,10,000
Debt (Interest at 10% p.a.)		1,80,000
(Interest at 16% p.a.)	(3,00,000–1,80,000)	1,20,000
Total Funds		10,00,000

(b) Determination of post-tax average cost of additional debt

$K_D = I (1 – t)$

Where,

I = Interest Rate

t = Corporate tax-rate

On ₹ 1,80,000 = 10% (1 – 0.5) = 5% or 0.05

On ₹ 1,20,000 = 16% (1 – 0.5) = 8% or 0.08

Average Cost of Debt

$$= \frac{(₹\ 1{,}80{,}000 \times 0.05) + (₹\ 1{,}20{,}000 \times 0.08)}{₹\ 3{,}00{,}000} \times 100 = 6.2\%$$

(c) Determination of cost of retained earnings and cost of equity applying Dividend growth model:

$$K_e = \frac{D_1}{P_0} + g$$

Where,

K_e = Cost of equity

$D_1 = D_O(1+g)$

D_0 = Dividend payout (i.e., 50% earnings = 50% × ₹ 4 = ₹ 2)

g = Growth rate

P_0 = Current market price per share

Then, $K_e = \frac{₹\ 2(1.1)}{₹\ 44} + 10\% = \frac{₹\ 2.2}{₹\ 44} + 10\% = 5\% + 10\% = 15\%$

(d) Computation of overall weighted average after tax cost of additional finance

Particular	(₹)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	7,00,000	0.70	15%	10.5
Debt	3,00,000	0.30	6.2%	1.86
WACC				12.36

Illustration 18

The following details are provided by the GPS Limited :

	(₹)
Equity Share Capital	*65,00,000*
12% Preference Share Capital	*12,00,000*
15% Redeemable Debentures	*20,00,000*
10% Convertible Debentures	*8,00,000*

The cost of equity capital for the company is 16.30% and Income Tax rate for the company is 30%.

You are required to calculate the Weighted Average Cost of Capital (WACC) of the company.

Solution:

Calculation of Weighted Average Cost of Capital (WACC)

Source	Amount (₹)	Weight	Cost of Capital after tax	WACC
Equity Capital	65,00,000	0.619	0.163	0.1009
12% Preference Capital	12,00,000	0.114	0.120	0.0137
15% Redeemable Debentures	20,00,000	0.190	0.105*	0.020
10% Convertible Debentures	8,00,000	0.076	0.07**	0.0053
Total	1,05,00,000	1.0000		0.1399

* Cost of Debentures (after tax) = 15 (1 – 0.30) = 10.5% = 0.105

** Cost of Debentures (after tax) = 10 (1 – 0.30) = 7% = 0.07

Weighted Average Cost of Capital = 0.1399 = 13.99%

(Note: In the above solution, the Cost of Debentures has been computed in the above manner without considering the impact of special features i.e. redeemability and convertibility in absence of requisite information.)

4.11 Conclusion

The determination of cost of capital is, thus, beset with a number of problems in dynamic world of today. Conditions which are present now may not remain static in future. Therefore, howsoever cost of capital is determined now, it is dependent on certain conditions or situations which are subject to change.

Firstly, the firm's internal structure and character change. For instance, as the firm grows and matures, its business risk may decline resulting in new structure and cost of capital.

Secondly, capital market conditions may change, making either debt or equity more favourable than the other.

Thirdly, supply and demand for funds may vary from time to time leading to change in cost of different components of capital.

Fourthly, the company may experience subtle change in capital structure because of retained earnings unless its growth rate is sufficient to call for employment of debt on a continuous basis.

Because of these reasons the firm should periodically re-examine its cost of capital before determining annual capital budget.

UNIT – II : CAPITAL STRUCTURE DECISIONS

Learning Objectives

After studying this chapter you will be able to:

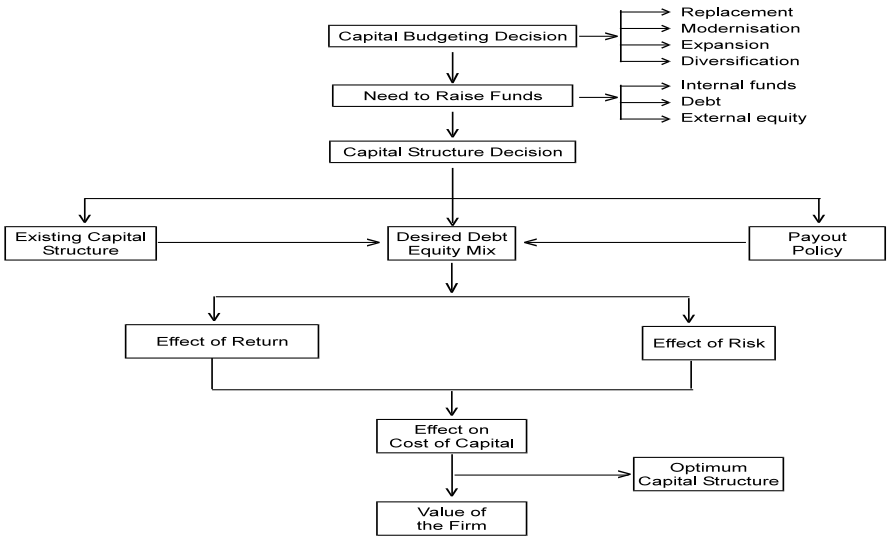
- Define and explain in detail the term capital structure.
- Discuss what is an optimal capital structure for a business?
- Understand different theories relating to the valuation of a firm.
- Understand EBIT-EPS break even or indifference analysis and how to construct and interpret an EBIT-EPS chart.
- Understand the concept of capitalization, over-capitalization and under-capitalisation.

4.12 Meaning of Capital Structure

Capital structure is the combination of capitals from different sources of finance. The capital of a company consists of equity share holders' fund, preference share capital and long term external debts. The source and quantum of capital is decided on the basis of need of the company and the cost of the capital. However, the objective of a company is to maximise the value of the company and it is prime objective while deciding the optimal capital structure.

Capital Structure decision refers to deciding the forms of financing (which sources to be tapped); their actual requirements (amount to be funded) and their relative proportions (mix) in total capitalisation.

Whenever funds are to be raised to finance investments, capital structure decision is involved. A demand for raising funds generates a new capital structure since a decision has to be made as to the quantity and forms of financing. The process of financing or capital structure decision is depicted in the figure below.



Financing Decision Process (*Source: Financial Management I.M. Pandey*)

4.13 Designing Capital Structure

A firm has the choice to raise funds for financing its investment proposals from different sources in different proportions. It can:

(a) Exclusively use debt (in case of existing company), or

(b) Exclusively use equity capital, or

(c) Exclusively use preference share capital (in case of existing company), or

(d) Use a combination of debt and equity in different proportions, or

(e) Use a combination of debt, equity and preference capital in different proportions, or

(f) Use a combination of debt and preference capital in different proportion (in case of existing company).

The choice of the combination of these sources is called capital structure mix. But the question is which of the pattern should the firm choose?

Factors Governing Capital Structure

While choosing a suitable financing pattern, certain fundamental principles should be kept in mind, which are discussed below:

(a) *Cost Principle:* According to this principle, an ideal pattern or capital structure is one that minimises cost of capital structure and maximises earnings per share (EPS). For e.g. Debt capital is cheaper than equity capital from the point of its cost and interest being deductible for income tax purpose, whereas no such deduction is allowed for dividends.

(b) *Risk Principle:* According to this principle, reliance is placed more on common equity for financing capital requirements than excessive use of debt. Use of more and more debt means higher commitment in form of interest payout. This would lead to erosion of shareholders value in unfavourable business situation. There are two risks associated with this principle:

(i) *Business risk:* It is an unavoidable risk because of the environment in which the firm has to operate and it is represented by the variability of earnings before interest and tax (EBIT). The variability in turn is influenced by revenues and expenses. Revenues and expenses are affected by demand of firm products, variations in prices and proportion of fixed cost in total cost.

(ii) *Financial risk:* It is a risk associated with the availability of earnings per share caused by use of financial leverage. It is the additional risk borne by the shareholders when a firm uses debt in addition to equity financing.

Generally, a firm should neither be exposed to high degree of business risk and low degree of financial risk or vice-versa, so that shareholders do not bear a higher risk.

(c) *Control Principle:* While designing a capital structure, the finance manager may also keep in mind that existing management control and ownership remains undisturbed. Issue of new equity will dilute existing control pattern and also it involves higher cost. Issue of more debt causes no dilution in control, but causes a higher degree of financial risk.

(d) *Flexibility Principle:* By flexibility it means that the management chooses such a combination of sources of financing which it finds easier to adjust according to changes in need of funds in future too. While debt could be interchanged (If the company is loaded with a debt of 18% and funds are available at 15%, it can return old debt with new debt, at a lesser interest rate), but the same option may not be available in case of equity investment.

(e) *Other Considerations:* Besides above principles, other factors such as nature of industry, timing of issue and competition in the industry should also be considered. Industries facing severe competition also resort to more equity than debt.

Thus a finance manager in designing a suitable pattern of capital structure must bring about satisfactory compromise between the above principles. The compromise can be reached by assigning weights to these principles in terms of various characteristics of the company.

4.14 Key Concepts for Designing Optimal Structure

The capital structure decisions are so significant in financial management, as they influence debt – equity mix which ultimately affects shareholders return and risk.

Since cost of debt is cheaper, firm prefers to borrow rather than to raise from equity. So long as return on investment is more than the cost of borrowing, extra borrowing increases the earnings per share. However, beyond a limit, it increases the risk and share price may fall because shareholders may assume that their investment is associated with more risk.

For an appropriate debt -equity mix, let us discuss some key concepts:-

4.14.1 Leverages: There are two leverages associated with the study of capital structure, namely operating leverage and financial leverage.

Operating leverage:- Operating leverage exists when a firm has a fixed cost that must be defrayed regardless of volume of business. It can be defined as the firm's ability to use fixed operating costs to magnify the effects of changes in sales on its earnings before interest and taxes. In simple words, the percentage change in profits accompanying a change in volume is greater than the percentage change in volume.

Operating leverage can also be defined in terms of Degree of Operating Leverage (DOL). When proportionate change in EBIT as of result of a given change in sales is more than the proportionate change in sales, operating leverage exists. The greater the DOL, the higher is the operating leverage.

Therefore, DOL exists when Percentage change in EBIT/Percentage change in Sales is > 1

Financial leverage:- Financial leverage involves the use of fixed cost of financing and refers to the mix of debt and equity in the capitalisation of a firm. Financial leverage is a superstructure built on the operating leverage. It results from the presence of fixed financial charges in the firm's income stream. They are to be paid regardless of the amount of EBIT available to pay them. After paying them, the operating profits (EBIT) belong to the ordinary shareholders.

In simple words, financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to the shareholders.

Positive Financial Leverage occurs when the firm earns more on the assets purchased with the funds, than the fixed cost of their use. Financial Leverage is also called as "Trading on Equity".

The degree of financial leverage can be found out as:

$$\frac{\text{Percentage change in Earnings per share (EPS)}}{\text{Percentage change in Earnings before interest and tax (EBIT)}}$$

Positive Financial Leverage occurs when the result of above is greater than 1.

Operating Leverage vis-à-vis Financial Leverage:- A company having higher operating leverage should be accompanied by a low financial leverage and vice versa, otherwise it will face problems of insolvency and inadequate liquidity. Thus, a combination of both the leverages is a challenging task.

However, the determination of optimal level of debt is a formidable task and is a major policy decision. Determination of optimal level of debt involves equalising between return and risk. EBIT-EPS analysis is a widely used tool to determine level of debt in a firm. Through this analysis, a comparison can be drawn for various methods of financing by obtaining indifference point. It is a point to the EBIT level at which EPS remains unchanged irrespective of level of debt-equity mix. The concepts of leverages and EBIT-EPS analysis would be dealt in detail separately for better understanding.

4.14.2 Coverage Ratio: The ability of the firm to use debt in the capital structure can also be judged in terms of coverage ratio namely EBIT/Interest. Higher the ratio, greater is the certainty of meeting interest payments.

4.14.3 Cash flow Analysis: It is a good supporting tool for EBIT-EPS analysis in framing a suitable capital structure. To determine the debt capacity, cash flow under adverse conditions should be examined. A high debt equity ratio is not risky if the company has the ability to generate cash flows. It would, therefore, be possible to increase the debt until cash flows equal the risk set out by debt.

The main drawback of this approach is that it fails to take into account uncertainty due to technological developments or changes in political climate.

These approaches as discussed above do not provide solution to the problem of determining

an appropriate level of debt. However, with the information available a range can be determined for an optimum level of debt in the capital structure.

4.15 Optimal Capital Structure

The theory of optimal capital structure deals with the issue of the right mix of debt and equity in the long term capital structure of a firm. This theory states that if a company takes on debt, the value of the firm increases up to a point. Beyond that point if debt continues to increase then the value of the firm will start to decrease. Similarly if the company is unable to repay the debt within the specified period then it will affect the goodwill of the company in the market and may create problems for collecting further debt. Therefore, the company should select its appropriate capital structure with due consideration to the factors mentioned earlier.

4.16 EBIT-EPS Analysis

The basic objective of financial management is to design an appropriate capital structure which can provide the highest earnings per share (EPS) over the company's expected range of earnings before interest and taxes (EBIT).

EPS measures a company's performance for the shareholders. The level of EBIT varies from year to year and represents the success of a company's operations. EBIT-EPS analysis is a vital tool for designing the optimal capital structure of a company.

The objective of this analysis is to find the EBIT level that will equate EPS regardless of the financing plan chosen.

Financial Break-even and Indifference Analysis

Financial break-even point is the minimum level of EBIT needed to satisfy all the fixed financial charges i.e. interest and preference dividends. It denotes the level of EBIT for which the company's EPS equals zero.

If the EBIT is less than the financial breakeven point, then the EPS will be negative but if the expected level of EBIT is more than the breakeven point, then more fixed costs financing instruments can be taken in the capital structure, otherwise, equity would be preferred.

EBIT-EPS breakeven analysis is used for determining the appropriate amount of debt a company might carry.

Another method of considering the impact of various financing alternatives on earnings per share is to prepare the EBIT chart or the range of Earnings Chart. This chart shows the likely EPS at various probable EBIT levels. Thus, under one particular alternative, EPS may be ₹ 2 at a given EBIT level. However, the EPS may go down if another alternative of financing is chosen even though the EBIT remains at the same level. At a given EBIT, earnings per share under various alternatives of financing may be plotted. A straight line representing the EPS at various levels of EBIT under the alternative may be drawn. Wherever this line intersects, it is known as break-even point. This point is a useful guide in formulating the capital structure. This is known as EPS equivalency point or indifference point since this shows that, between

the two given alternatives of financing (i.e., regardless of leverage in the financial plans), EPS would be the same at the given level of EBIT.

The equivalency or indifference point can also be calculated algebraically in the following manner:

$$\frac{(EBIT - I_1)(1-T)}{E_1} = \frac{(EBIT - I_2)(1-T)}{E_2}$$

Where,

EBIT = Indifference point

E_1 = Number of equity shares in Alternative 1

E_2 = Number of equity shares in Alternative 2

I_1 = Interest charges in Alternative 1

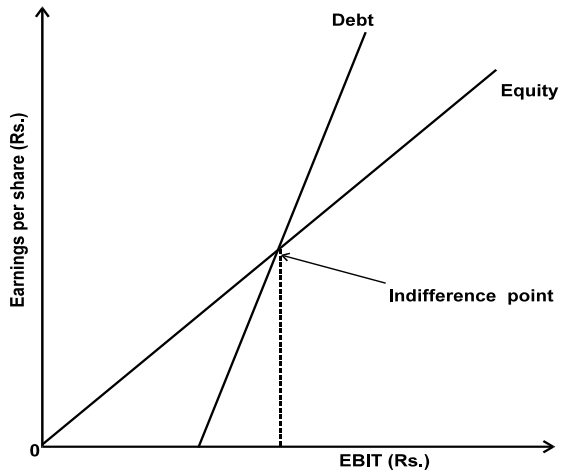
1_2 = Interest charges in Alternative 2

T = Tax-rate

Alternative 1= All equity finance

Alternative 2= Debt-equity finance.

The indifference point can also be depicted graphically as:



Debt-Equity Indifference Point

Illustration 19: *Best of Luck Ltd., a profit making company, has a paid-up capital of ₹ 100 lakhs consisting of 10 lakhs ordinary shares of ₹ 10 each. Currently, it is earning an annual pre-tax profit of ₹ 60 lakhs. The company's shares are listed and are quoted in the range of ₹ 50 to ₹ 80. The management wants to diversify production and has approved a project which will cost ₹ 50 lakhs and which is expected to yield a pre-tax income of ₹ 40 lakhs per annum. To raise this additional capital, the following options are under consideration of the*

management:

(a) *To issue equity share capital for the entire additional amount. It is expected that the new shares (face value of ₹ 10) can be sold at a premium of ₹ 15.*
(b) *To issue 16% non-convertible debentures of ₹ 100 each for the entire amount.*
(c) *To issue equity capital for ₹ 25 lakhs (face value of ₹ 10) and 16% non-convertible debentures for the balance amount. In this case, the company can issue shares at a premium of ₹ 40 each.*

You are required to advise the management as to how the additional capital can be raised, keeping in mind that the management wants to maximise the earnings per share to maintain its goodwill. The company is paying income tax at 50%.

Solution:

Calculation of Earnings per share under the three options:

Particulars	*Options*		
	Option I: Issue Equity shares only	*Option II: Issue 16% Debentures only*	*Option III: Issue Equity Shares and 16% Debentures of equal amount*
Number of Equity Shares (nos):			
-Existing	10,00,000	10,00,000	10,00,000
-Newly issued	2,00,000 $\left(\frac{₹50,00,000}{₹(10+15)}\right)$	---	50,000 $\left(\frac{₹25,00,000}{₹(10+40)}\right)$
Total	12,00,000	10,00,000	10,50,000
16% Debentures (₹)	---	50,00,000	25,00,000
Profit Before Interest and Tax:	(₹)	(₹)	(₹)
-Existing pre-tax profit	60,00,000	60,00,000	60,00,000
-From new projects	40,00,000	40,00,000	40,00,000
	1,00,00,000	1,00,00,000	1,00,00,000
Less: Interest on 16% Debentures	---	8,00,000 (16% ×₹50,00,000)	4,00,000 (16% × ₹25,00,000)

Profit Before Tax	1,00,00,000	92,00,000	96,00,000
Tax at 50%	50,00,000	46,00,000	48,00,000
Profit After Tax	50,00,000	46,00,000	48,00,000
Earnings Per Share (EPS) $\left(\frac{\text{PAT}}{\text{No. of Shares}}\right)$	4.17 $\left(\frac{₹50,00,000}{12,00,000}\right)$	4.60 $\left(\frac{₹46,00,000}{10,00,000}\right)$	4.57 $\left(\frac{₹48,00,000}{10,50,000}\right)$

Advise: Option II i.e. issue of 16% Debentures is most suitable to maximize the earnings per share.

Illustration 20 : *Shahji Steels Limited requires ₹ 25,00,000 for a new plant. This plant is expected to yield earnings before interest and taxes of ₹ 5,00,000. While deciding about the financial plan, the company considers the objective of maximizing earnings per share. It has three alternatives to finance the project - by raising debt of ₹ 2,50,000 or ₹ 10,00,000 or ₹ 15,00,000 and the balance, in each case, by issuing equity shares. The company's share is currently selling at ₹ 150, but is expected to decline to ₹ 125 in case the funds are borrowed in excess of ₹ 10,00,000. The funds can be borrowed at the rate of 10 percent upto ₹ 2,50,000, at 15 percent over ₹ 2,50,000 and upto ₹ 10,00,000 and at 20 percent over ₹ 10,00,000. The tax rate applicable to the company is 50 percent. Which form of financing should the company choose?*

Solution:

Plan I = Raising Debt of ₹ 2.5 lakh + Equity of ₹ 22.5 lakh.

Plan II = Raising Debt of ₹ 10 lakh + Equity of ₹ 15 lakh.

Plan III = Raising Debt of ₹ 15 lakh + Equity of ₹ 10 lakh.

Calculation of Earnings per share (EPS):

Particulars	Financial Plans		
	Plan I (₹)	Plan II (₹)	Plan III (₹)
Expected EBIT	5,00,000	5,00,000	5,00,000
Less: Interest [(a)]	(25,000)	(1,37,500)	(2,37,500)
Earnings before taxes	4,75,000	3,62,500	2,62,500
Less: Taxes @50%	(2,37,500)	(1,81,250)	(1,31,250)
Earnings after taxes (EAT)	2,37,500	1,81,250	1,31,250
Number of shares [(b)]	15,000	10,000	8,000
Earnings per share (EPS)	15.83	18.13	16.41

Financing Plan II (i.e. Raising debt of ₹10 lakh and issue of equity share capital of ₹15 lakh) is the option which maximises the earnings per share.

Working Notes:

(a) Calculation of interest on Debt.

Plan I	(₹2,50,000 × 10%)		₹ 25,000
Plan II	(₹2,50,000 × 10%)	₹ 25,000	
	(₹7,50,000 × 15%)	₹1,12,500	₹1,37,500
Plan III	(₹2,50,000 × 10%)	₹ 25,000	
	(₹7,50,000 × 15%)	₹1,12,500	
	(₹5,00,000 × 20%)	₹1,00,000	₹2,37,500

(b) Number of equity shares to be issued

Plan I: $\frac{₹\ 22,50,000}{₹\ 150\ \text{(Market price of share)}} = 15,000\ \text{shares}$

Plan II: $\frac{₹\ 15,00,000}{₹\ 150} = 10,000\ \text{shares}$

Plan III: $\frac{₹\ 10,00,000}{₹\ 125} = 8,000\ \text{shares}$

Illustration 21 *: Ganesha Limited is setting up a project with a capital outlay of ₹ 60,00,000. It has two alternatives in financing the project cost.*

Alternative-I: 100% equity finance by issuing equity shares of ₹10 each

Alternative-II: Debt-equity ratio 2:1(equity shares will be of ₹10 each)

The rate of interest payable on the debts is 18% p.a. The corporate tax rate is 40%. Calculate the indifference point between the two alternative methods of financing.

Solution:

Calculation of Indifference point between the two alternatives of financing.

Alternative-I By issue of 6,00,000 equity shares of ₹ 10 each amounting to ₹ 60 lakhs. No financial charges are involved.

Alternative-II By raising the funds in the following way:

Debt = ₹ 40 lakhs

Equity = ₹ 20 lakhs (2,00,000 equity shares of ₹ 10 each)

Interest payable on debt = $40,00,000 \times \frac{18}{100}$ = ₹ 7,20,000

The difference point between the two alternatives is calculated by:

$$\frac{(EBIT - I_1)\ (1-T)}{E_1} = \frac{(EBIT - I_2)\ (1\text{-}T)}{E_2}$$

Where, EBIT = Earnings before interest and taxes

I_1 = Interest charges in Alternative-I

I_2 = Interest charges in Alternative-II

T = Tax rate

E_1 = Equity shares in Alternative-I

E_2 = Equity shares in Alternative-II

Putting the values, the break-even point would be as follows:

$$\frac{(EBIT - 0)\,(1-0.40)}{6,00,000} = \frac{(EBIT - 7,20,000)\,(1-0.40)}{2,00,000}$$

$$\frac{(EBIT)\,(0.60)}{6,00,000} = \frac{(EBIT - 7,20,000)\,(0.60)}{2,00,000}$$

$$\frac{EBIT(0.60)}{3} = \frac{0.60(EBIT - 7,20,000)}{1}$$

$$EBIT = 3EBIT - 21,60,000$$

$$-2\ EBIT = -21,60,000$$

$$EBIT = \frac{21,60,000}{2}$$

EBIT = ₹10,80,000

Therefore, at EBIT of ₹10,80,000 earnings per share for the two alternatives is equal.

Illustration 22 : *Ganapati Limited is considering three financing plans. The key information is as follows:*

(a) Total investment to be raised ₹ 2,00,000

(b) Plans of Financing Proportion:

Plans	*Equity*	*Debt*	*Preference Shares*
A	*100%*	*-*	*-*
B	*50%*	*50%*	*-*
C	*50%*	*-*	*50%*

(c) Cost of debt 8%

Cost of preference shares 8%

(d) Tax rate 50%

(e) Equity shares of the face value of ₹ 10 each will be issued at a premium of ₹ 10 per share.

(f) Expected EBIT is ₹ 80,000.

You are required to determine for each plan: -

(i) Earnings per share (EPS)

(ii) The financial break-even point.

(iii) Indicate if any of the plans dominate and compute the EBIT range among the plans for indifference.

Solution

(i) Computation of Earnings per share (EPS)

Plans	*A*	*B*	*C*
Earnings before interest and tax (EBIT)	80,000	80,000	80,000
Less: Interest charges	---	(8,000) (8% × ₹1 lakh)	---
Earnings before tax (EBT)	80,000	72,000	80,000
Less: Tax (@ 50%)	(40,000)	(36,000)	(40,000)
Earnings after tax (EAT)	40,000	36,000	40,000
Less: Preference Dividend	---	---	(8,000) (8% × ₹1 lakh)
Earnings available for Equity shareholders (A)	40,000	36,000	32,000
No. of Equity shares (B)	10,000 (₹2 lakh ÷ ₹20)	5,000 (₹1 lakh ÷ ₹20)	5,000 (₹1 lakh ÷ ₹20)
EPS (₹) [(A) ÷ (B)]	4	7.20	6.40

(ii) Calculation of Financial Break-even point

Financial break-even point is the earnings which are equal to the fixed finance charges and preference dividend.

Plan A: Under this plan there is no interest or preference dividend payment hence, the Financial Break-even point will be zero.

Plan B : Under this plan there is an interest payment of ₹8,000 and no preference dividend, hence, the Financial Break-even point will be ₹ 8,000 (Interest charges).

Plan C : Under this plan there is no interest payment but an after tax preference dividend of ₹ 8,000 is paid. Hence, the Financial Break-even point will be before tax earnings of ₹ 16,000 (i.e. ₹ 8,000 ÷ 0.5 = ₹16,000.)

(iii) Computation of indifference point between the plans.

The indifference between two alternative methods of financing is calculated by applying the following formula.

$$\frac{(EBIT - I_1)(1-T)}{E_1} = \frac{(EBIT - I_2)(1-T)}{E_2}$$

Where,

EBIT = Earnings before interest and tax.

I_1 = Fixed charges (interest or pref. dividend) under Alternative

I_2 = Fixed charges (interest or pref. dividend) under Alternative T = Tax rate

E_1 = No. of equity shares in Alternative 1

E_2 = No. of equity shares in Alternative 2

Now, we can calculate indifference point between different plans of financing.

I. Indifference point where EBIT of Plan A and Plan B is equal.

$$\frac{(EBIT - 0)(1-0.5)}{10,000} = \frac{(EBIT - 8,000)(1-0.5)}{5,000}$$

0.5 EBIT (5,000) = (0.5 EBIT – 4,000) (10,000)

0.5 EBIT = EBIT – 8,000

0.5 EBIT = 8,000

EBIT = ₹16,000

II. Indifference point where EBIT of Plan A and Plan C is equal.

$$\frac{(EBIT - 0)(1-0.5)}{10,000} = \frac{(EBIT - 0)(1-0.5) - 8,000}{5,000}$$

$$\frac{0.5\,EBIT}{10,000} = \frac{0.5\ EBIT - 8,000}{5,000}$$

0.25 EBIT = 0.5 EBIT – 8,000

0.25 EBIT = 8,000

EBIT = ₹ 32,000

III. Indifference point where EBIT of Plan B and Plan C are equal.

$$\frac{(EBIT - 8{,}000)(1-0.5)}{5{,}000} = \frac{(EBIT - 0)(1-0.5) - 8{,}000}{5{,}000}$$

$$0.5\ EBIT - 4{,}000 = 0.5\ EBIT - 8{,}000$$

There is no indifference point between the financial plans B and C.

It can be seen that Financial Plan B dominates Plan C. Since, the financial break-even point of the former is only ₹ 8,000 but in case of latter it is ₹ 16,000.

Illustration 23: *Yoyo Limited presently has ₹ 36,00,000 in debt outstanding bearing an interest rate of 10 per cent. It wishes to finance a ₹ 40,00,000 expansion programme and is considering three alternatives: additional debt at 12 per cent interest, preference shares with an 11 per cent dividend, and the issue of equity shares at ₹ 16 per share. The company presently has 8,00,000 shares outstanding and is in a 40 per cent tax bracket.*

(a) If earnings before interest and taxes are presently ₹ 15,00,000, what would be earnings per share for the three alternatives, assuming no immediate increase in profitability?

(b) Develop an indifference chart for these alternatives. What are the approximate indifference points? To check one of these points, what is the indifference point mathematically between debt and common?

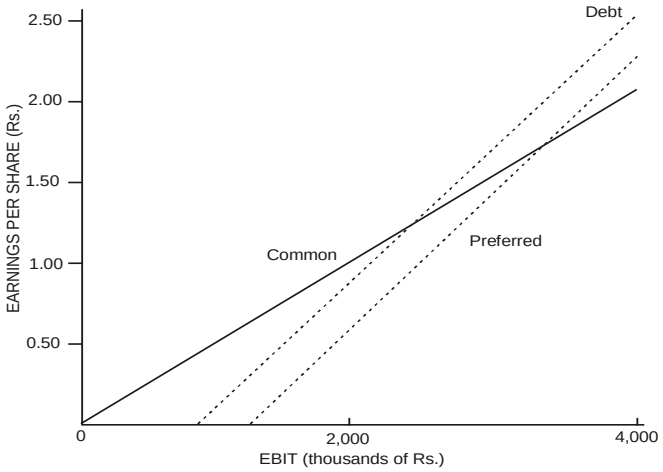
(c) Which alternative do you prefer? How much would EBIT need to increase before the next alternative would be best?

Solution:

(a)

Particulars	Alternatives		
	Alternative–I : Take additional Debt	Alternative-II: Issue 11% Preference Shares	Alternative-III: Issue further Equity Shares
	(₹)	(₹)	(₹)
EBIT	15,00,000	15,00,000	15,00,000
Interest on Debts:			
- on existing debt @10%	(3,60,000)	(3,60,000)	(3,60,000)
- on new debt @ 12%	(4,80,000)	---	---
Profit before taxes	6,60,000	11,40,000	11,40,000
Taxes @ 40%	(2,64,000)	(4,56,000)	(4,56,000)
Profit after taxes	3,96,000	6,84,000	6,84,000
Preference shares dividend	---	(4,40,000)	---

Earnings available to equity Shareholders	3,96,000	2,44,000	6,84,000
Number of shares	8,00,000	8,00,000	10,50,000
Earnings per share	0.495	0.305	0.651



(b) Approximate indifference points: Debt and equity shares, ₹ 24 lakhs, preference and equity shares, ₹ 33 lakhs in EBIT; Debt dominates preferred by the same margin throughout, there is no difference point. Mathematically, the indifference point between debt and equity shares is (in thousands):

$$\frac{EBIT^* - ₹\ 840}{800} = \frac{EBIT^* - ₹\ 360}{1{,}050}$$

EBIT* (1,050) – ₹ 840(1,050) = EBIT* (800) – ₹ 360 (800)

250EBIT* = ₹5,94,000

EBIT* = ₹2,376

Note that for the debt alternative, the total before-tax interest is ₹840, and this is the intercept on the horizontal axis. For the preferred stock alternative, we divide ₹440 by (1–0.40) to get ₹733. When this is added to ₹360 in interest on existing debt, the intercept becomes ₹1,093.

(c) For the present EBIT level, equity shares is clearly preferable. EBIT would need to increase by ₹2,376 – ₹1,500 = ₹876 before an indifference point with debt is reached. One would want to be comfortably above this indifference point before a strong case for debt should be made. The lower the probability that actual EBIT will fall below the

indifference point, the stronger the case that can be made for debt, all other things remain the same.

Illustration 24: *Alpha Limited requires funds amounting to ₹ 80 lakh for its new project. To raise the funds, the company has following two alternatives:*

(i) to issue Equity Shares of ₹ 100 each (at par) amounting to ₹ 60 lakh and borrow the balance amount at the interest of 12% p.a.; or

(ii) to issue Equity Shares of ₹ 100 each (at par) and 12% Debentures in equal proportion.

The Income-tax rate is 30%.

Find out the point of indifference between the available two modes of financing and state which option will be beneficial in different situations.

Solution:

(i) Amount = ₹ 80,00,000

Plan I = Equity of ₹ 60,00,000 + Debt of ₹ 20,00,000

Plan II = Equity of ₹ 40,00,000 + 12% Debentures of ₹ 40,00,000

Plan I: Interest Payable on Loan

= 12% × ₹ 20,00,000 = ₹ 2,40,000

Plan II: Interest Payable on Debentures

= 12% × ₹ 40,00,000 = ₹ 4,80,000

Computation of Point of Indifference

$$\frac{(EBIT - I_1)(1-t)}{E_1} = \frac{(EBIT - I_2)(1-t)}{E_2}$$

$$\frac{(EBIT - ₹2,40,000)(1-0.3)}{60,000} = \frac{(EBIT - ₹4,80,000)(1-0.3)}{40,000}$$

2 (EBIT – ₹ 2,40,000) = 3 (EBIT – ₹ 4,80,000)

2 EBIT – ₹ 4,80,000 = 3 EBIT – ₹ 14,40,000

2 EBIT – 3 EBIT = -₹ 14,40,000 + ₹ 4,80,000

EBIT = ₹ 9,60,000

(ii) Earnings per share (EPS) under Two Situations for both the Plans

Situation A (EBIT is assumed to be ₹ 9,50,000)		
Particulars	Plan I	Plan II
EBIT	9,50,000	9,50,000

Less: Interest @ 12%	(2,40,000)	(4,80,000)
EBT	7,10,000	4,70,000
Less: Taxes @ 30%	(2,13,000)	(1,41,000)
EAT	4,97,000	3,29,000
No. of Equity Shares	60,000	40,000
EPS	8.28	8.23

Comment: In Situation A, when expected EBIT is less than the EBIT at indifference point then, Plan I is more viable as it has higher EPS. The advantage of EPS would be available from the use of equity capital and not debt capital.

Situation B (EBIT is assumed to be ₹ 9,70,000)		
Particulars	Plan I	Plan II
EBIT	9,70,000	9,70,000
Less: Interest @ 12%	(2,40,000)	(4,80,000)
EBT	7,30,000	4,90,000
Less: Taxes @ 30%	(2,19,000)	(1,47,000)
EAT	5,11,000	3,43,000
No. of Equity Shares	60,000	40,000
EPS	8.52	8.58

Comment: In Situation B, when expected EBIT is more than the EBIT at indifference point then, Plan II is more viable as it has higher EPS. The use of fixed-cost source of funds would be beneficial from the EPS viewpoint. In this case, financial leverage would be favourable.

(Note: The problem can also be worked out assuming any other figure of EBIT which is more than 9,60,000 and any other figure less than 9,60,000. Alternatively, the answer may also be based on the factors/governing the capital structure like the cost, risk, control, etc. Principles).

4.17 Cost of Capital, Capital Structure and Market Price of Share

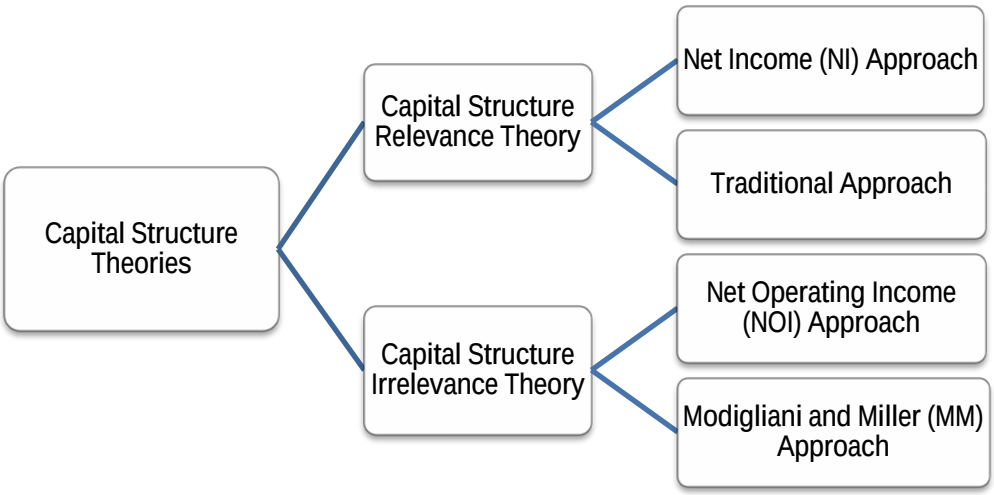
The financial leverage has a magnifying effect on earnings per share, such that for a given level of percentage increase in EBIT, there will be more than proportionate change in the same direction in the earnings per share. The financing decision of the firm is one of the basic conditions oriented to the achievement of maximisation for the shareholders wealth. The capital structure should be examined from the view point of its impact on the value of the firm. If the capital structure affects the total value of the firm, a firm should select such a financing mix (a combination of debt and equity) which will maximise the market value of the firm. Such an optimum leverage not only maximises the value of the company and wealth of its owners, but also minimises the cost of capital. As a result, the company is able to increase its

economic rate of investment and growth.

In theory, capital structure can affect the value of the firm by affecting either its expected earnings or cost of capital or both. While financing mix cannot affect the total earnings, it can affect the share of earnings belonging to the share holders. But financial leverage can largely influence the value of the firm through the cost of capital.

4.18 Capital Structure Theories

The following approaches explain the relationship between cost of capital, capital structure and value of the firm:



(a) Net Income (NI) approach

(b) Traditional approach.

(c) Net Operating Income (NOI) approach

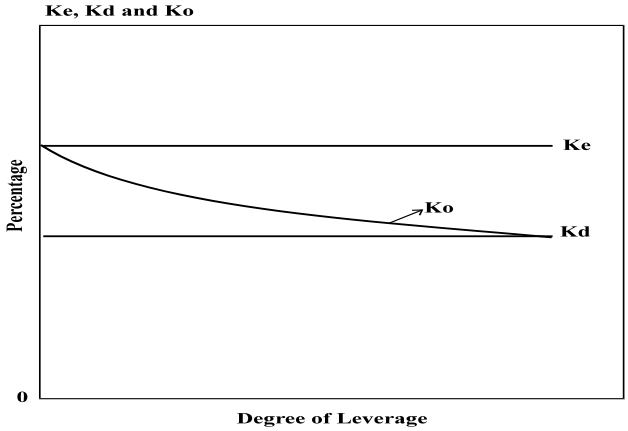
(d) Modigliani-Miller (MM) approach

However, the following assumptions are made to understand this relationship.

- There are only two kinds of funds used by a firm i.e. debt and equity.
- Taxes are not considered.
- The payout ratio is 100%.
- The firm's total financing remains constant.
- Business risk is constant over time.
- The firm has perpetual life.

4.18.1 Net Income (NI) Approach: According to this approach, capital structure decision is relevant to the value of the firm. An increase in financial leverage will lead to decline in the

weighted average cost of capital (WACC), while the value of the firm as well as market price of ordinary share will increase. Conversely, a decrease in the leverage will cause an increase in the overall cost of capital and a consequent decline in the value as well as market price of equity shares.



From the above diagram, K_e and K_d are assumed not to change with leverage. As debt increases, it causes weighted average cost of capital (WACC) to decrease.

The value of the firm on the basis of Net Income Approach can be ascertained as follows:

$$V = S + D$$

Where,

V = Value of the firm

S = Market value of equity

D = Market value of debt

$$\text{Market value of equity (S)} = \frac{NI}{K_e}$$

Where,

NI = Earnings available for equity shareholders

K_e = Equity Capitalisation rate

Under, NI approach, the value of the firm will be maximum at a point where weighted average cost of capital (WACC) is minimum. Thus, the theory suggests total or maximum possible debt financing for minimising the cost of capital. The overall cost of capital under this approach is :

$$\text{Overall cost of capital} = \frac{\text{EBIT}}{\text{Value of the firm}}$$

Thus according to this approach, the firm can increase its total value by decreasing its overall cost of capital through increasing the degree of leverage. The significant conclusion of this approach is that it pleads for the firm to employ as much debt as possible to maximise its

value.

Illustration 25*: Rupa Ltd.'s EBIT is ₹ 5,00,000. The company has 10%, 20 lakh debentures. The equity capitalization rate i.e. K_e is 16%.*

You are required to calculate:

(i) Market value of equity and value of firm

(ii) Overall cost of capital.

Solution:

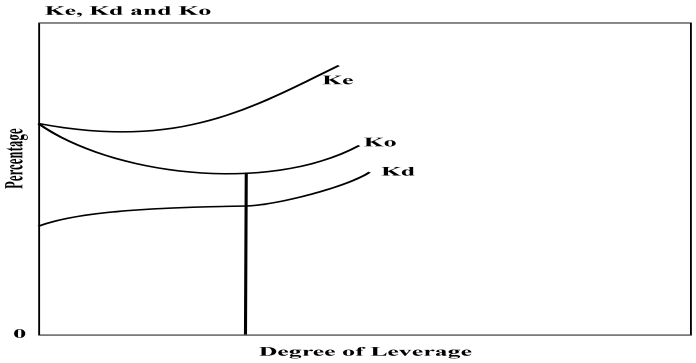
(i) Statement showing value of firm

	(₹)
EBIT	5,00,000
Less: Interest on debentures (10% of ₹ 20,00,000)	(2,00,000)
Earnings available for equity holders i.e. Net Income (NI)	3,00,000
Equity capitalization rate (K_e)	16%
Market value of equity $(S) = \frac{NI}{K_e} = \left(\frac{3,00,000}{16.00} \times 100\right)$	18,75,000
Market value of debt (D)	20,00,000
Total value of firm V = S + D	38,75,000

(ii) Overall cost of capital $= \frac{EBIT}{Value\ of\ firm} = \frac{5,00,000}{38,75,000} = 12.90\%$

4.18.2 Traditional Approach: This approach favours that as a result of financial leverage up to some point, cost of capital comes down and value of firm increases. However, beyond that point, reverse trends emerge. The principle implication of this approach is that the cost of capital is dependent on the capital structure and there is an optimal capital structure which minimises cost of capital.

At the optimal capital structure, the real marginal cost of debt and equity is the same. Before the optimal point, the real marginal cost of debt is less than real marginal cost of equity and beyond this optimal point the real marginal cost of debt is more than real marginal cost of equity.



The above diagram suggests that cost of capital is a function of leverage. It declines with K_d (debt) and starts rising. This means that there is a range of capital structure in which cost of capital is minimised.

Optimum capital structure occurs at the point where value of the firm is highest and the cost of capital is the lowest.

According to net operating income approach, capital structure decisions are totally irrelevant. Modigliani-Miller supports the net operating income approach but provides behavioural justification. The traditional approach strikes a balance between these extremes.

Main Highlights of Traditional Approach

(a) The firm should strive to reach the optimal capital structure and its total valuation through a judicious use of the both debt and equity in capital structure. At the optimal capital structure, the overall cost of capital will be minimum and the value of the firm will be maximum.

(b) Value of the firm increases with financial leverage upto a certain point. Beyond this point the increase in financial leverage will increase its overall cost of capital and hence the value of firm will decline. This is because the benefits of use of debt may be so large that even after offsetting the effect of increase in cost of equity, the overall cost of capital may still go down. However, if financial leverage increases beyond an acceptable limit, the risk of debt investor may also increase, consequently cost of debt also starts increasing. The increasing cost of equity owing to increased financial risk and increasing cost of debt makes the overall cost of capital to increase.

Illustration 26: *Indra Ltd. has EBIT of ₹ 1,00,000. The company makes use of debt and equity capital. The firm has 10% debentures of ₹ 5,00,000 and the firm's equity capitalization rate is 15%.*

You are required to compute:

(i) Current value of the firm

(ii) Overall cost of capital.

Solution:

(i) Calculation of total value of the firm

	(₹)
EBIT	1,00,000
Less: Interest (@10% on ₹ 5,00,000)	50,000
Earnings available for equity holders	50,000
Equity capitalization rate i.e. K_e	15%

$$\text{Value of equity holders} = \frac{\text{Earnings available for equity holders}}{K_e}$$

$$= \frac{50,000}{0.15} = ₹\ 3,33,333$$

Value of Debt (given) D	5,00,000
Total value of the firm V = D + S {5,00,000 + 3,33,333)	8,33,333

(ii) $$\text{Overall cost of capital} = K_o = K_e\left(\frac{S}{V}\right) + K_d\left(\frac{D}{V}\right)$$

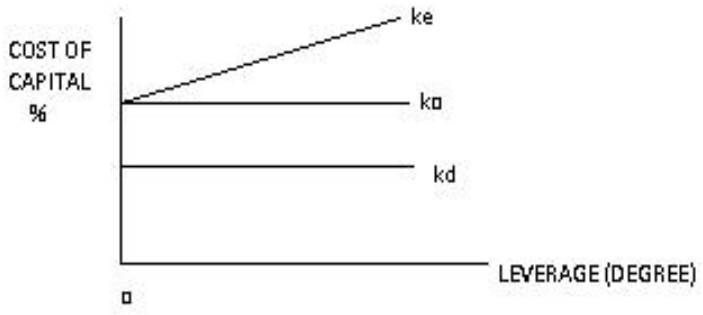
$$= 0.15\left(\frac{3,33,333}{8,33,333}\right) + 0.10\left(\frac{5,00,000}{8,33,333}\right)$$

$$= \frac{1}{8,33,333}[50,000 + 50,000] = 12.00\%$$

4.18.3 Net Operating Income Approach (NOI): NOI means earnings before interest and tax (EBIT). According to this approach, capital structure decisions of the firm are irrelevant.

Any change in the leverage will not lead to any change in the total value of the firm and the market price of shares, as the overall cost of capital is independent of the degree of leverage. As a result, the division between debt and equity is irrelevant.

As per this approach, an increase in the use of debt which is apparently cheaper is offset by an increase in the equity capitalisation rate. This happens because equity investors seek higher compensation as they are opposed to greater risk due to the existence of fixed return securities in the capital structure.



The above diagram shows that K_o (Overall capitalisation rate) and (debt – capitalisation rate) are constant and K_e (Cost of equity) increases with leverage.

Illustration 27: *Amita Ltd's operating income is ₹ 5,00,000. The firm's cost of debt is 10% and currently the firm employs ₹15,00,000 of debt. The overall cost of capital of the firm is 15%.*

You are required to determine:

(i) Total value of the firm.

(ii) Cost of equity.

Solution:

(i) Statement showing value of the firm

	(₹)
Net operating income/EBIT	5,00,000
Less: Interest on debentures (10% of ₹ 15,00,000)	(1,50,000)
Earnings available for equity holders	3,50,000
Total cost of capital (K_0) (given)	15%
Value of the firm $V = \frac{EBIT}{k_0} = \frac{5,00,000}{0.15}$	33,33,333

(ii) Calculation of cost of equity

	(₹)
Market value of debt (D)	15,00,000
Market value of equity (s) S = V − D = ₹33,33,333 – ₹15,00,000	18,33,333

$$K_e = \frac{\text{Earnings available for equity holders}}{\text{Value of equity (S)}}$$

$$\text{Or,} \qquad = \frac{\text{EBIT} - \text{Interest paid on debt}}{\text{Market value of equity}}$$

$$= \frac{₹3,50,000}{₹18,33,333} = 19.09\%$$

OR

$$K_o = K_e \left(\frac{S}{V}\right) + K_d \left(\frac{D}{V}\right)$$

$$K_e = K_o \left(\frac{V}{S}\right) - K_d \left(\frac{D}{S}\right) = 0.15 \left(\frac{33,33,333}{18,33,333}\right) - 0.10 \left(\frac{15,00,000}{18,33,333}\right)$$

$$= \frac{1}{18,33,333} \left[(0.15 \times 33,33,333) - (0.10 \times 15,00,000)\right]$$

$$= \frac{1}{18,33,333} \left[5,00,000 - 1,50,000\right] \quad = 19.09\%$$

Illustration 28: *Alpha Limited and Beta Limited are identical except for capital structures. Alpha Ltd. has 50 per cent debt and 50 per cent equity, whereas Beta Ltd. has 20 per cent debt and 80 per cent equity. (All percentages are in market-value terms). The borrowing rate for both companies is 8 per cent in a no-tax world, and capital markets are assumed to be perfect.*

(a) (i) If you own 2 per cent of the shares of Alpha Ltd., what is your return if the company has net operating income of ₹ 3,60,000 and the overall capitalisation rate of the company, K_0 is 18 per cent? (ii) What is the implied required rate of return on equity?

(b) Beta Ltd. has the same net operating income as Alpha Ltd. (i) What is the implied required equity return of Beta Ltd.? (ii) Why does it differ from that of Alpha Ltd.?

Solution:

(a) Value of the Alpha Ltd. = $\frac{\text{NOI}}{K_0} = \frac{₹3,60,000}{18\%}$ = ₹ 20,00,000

(i) Return on Shares on Alpha Ltd.

	(₹)
Value of the company	20,00,000
Market value of debt (50%)	10,00,000
Market value of shares (50%)	10,00,000
	(₹)
Net operating income	3,60,000

Interest on debt (8% × ₹10,00,000)	80,000
Earnings available to shareholders	2,80,000
Return on 2% shares (2% × ₹ 2,80,000)	5,600

(ii) Implied required rate of return on equity = $\frac{₹\ 2,80,000}{₹\ 10,00,000}$ = 28%

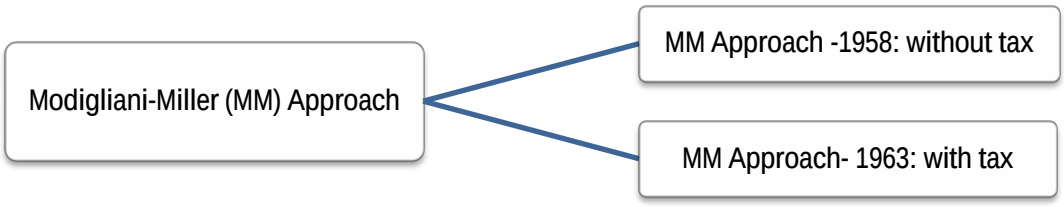
(b) (i) Calculation of Implied rate of return

	(₹)
Total value of company	20,00,000
Market value of debt (20% × ₹20,00,000)	4,00,000
Market value of equity (80% × ₹20,00,000)	16,00,000
	(₹)
Net operating income	3,60,000
Interest on debt (8%× ₹4,00,000)	32,000
Earnings available to shareholders	3,28,000

Implied required rate of return on equity = $\frac{₹\ 3,28,000}{₹\ 16,00,000}$ = 20.5%

(ii) It is lower than the Alpha Ltd. because Beta Ltd. uses less debt in its capital structure. As the equity capitalisation is a linear function of the debt-to-equity ratio when we use the net operating income approach, the decline in required equity return offsets exactly the disadvantage of not employing so much in the way of "cheaper" debt funds.

4.18.3 Modigliani-Miller Approach (MM): The NOI approach is definitional or conceptual and lacks behavioural significance. It does not provide operational justification for irrelevance of capital structure. However, Modigliani-Miller approach provides behavioural justification for constant overall cost of capital and, therefore, total value of the firm.



MM Approach- 1958: without tax:

This approach describes, in a perfect capital market where there is no transaction cost and no taxes, the value and cost of capital of a company remain unchanged irrespective of change in the capital structure. The approach is based on further additional assumptions like:

- Capital markets are perfect. All information is freely available and there are no transaction costs.
- All investors are rational.
- Firms can be grouped into 'Equivalent risk classes' on the basis of their business risk.
- Non-existence of corporate taxes.

Based on the above assumptions, Modigliani-Miller derived the following three propositions:

(i) Total market value of a firm is equal to its expected net operating income divided by the discount rate appropriate to its risk class decided by the market.

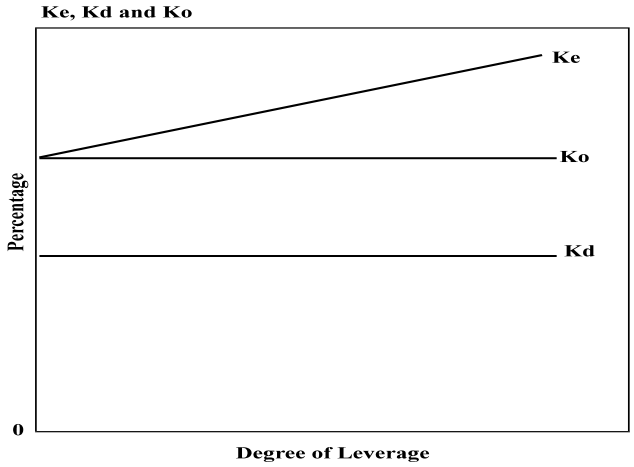
$$\text{Value of levered firm } (V_g) = \text{Value of unlevered firm } (V_u)$$

$$\text{Value of a firm} = \frac{\text{Net Operating Income (NOI)}}{K_0}$$

(ii) A firm having debt in capital structure has higher cost of equity than an unlevered firm. The cost equity will be include risk premium for the financial risk. The cost of equity in a levered firm is determined as under:

$$Ke = Ko + (Ko - Kd)\frac{\text{Debt}}{\text{Equity}}$$

(iii) The structure of the capital (financial leverage) does not effect the overall cost of capital. The cost of capital is only affected by the business risk.



It is evident from the above diagram that the average cost of the capital (K_o) is a constant and

not affected by leverage.

The operational justification of Modigliani-Miller hypothesis is explained through the functioning of the arbitrage process and substitution of corporate leverage by personal leverage. Arbitrage refers to buying asset or security at lower price in one market and selling it at a higher price in another market. As a result, equilibrium is attained in different markets. This is illustrated by taking two identical firms of which one has debt in the capital structure while the other does not. Investors of the firm whose value is higher will sell their shares and instead buy the shares of the firm whose value is lower. They will be able to earn the same return at lower outlay with the same perceived risk or lower risk. They would, therefore, be better off.

The value of the levered firm can neither be greater nor lower than that of an unlevered firm according this approach. The two must be equal. There is neither advantage nor disadvantage in using debt in the firm's capital structure.

The approach considers capital structure of a firm as a whole pie divided into equity, debt and other securities. No matter how the capital structure of a firm is divided (among debt, equity etc.), there is a conservation of investment value. Since the total investment value of a corporation depends upon its underlying profitability and risk, it is invariant with respect to relative changes in the firm's financial capitalisation.

According to MM, since the sum of the parts must equal the whole, therefore, regardless of the financing mix, the total value of the firm stays the same.

The shortcoming of this approach is that the arbitrage process as suggested by Modigliani-Miller will fail to work because of imperfections in capital market, existence of transaction cost and presence of corporate income taxes.

MM Approach- 1963: with tax

In 1963, MM model was amended by incorporating tax, they recognised that the value of the firm will increase or cost of capital will decrease where corporate taxes exist. As a result, there will be some difference in the earnings of equity and debt-holders in levered and unlevered firm and value of levered firm will be greater than the value of unlevered firm by an amount equal to amount of debt multiplied by corporate tax rate.

MM has developed the formulae for computation of cost of capital (K_o), cost of equity (K_e) for the levered firm.

(i) Value of a levered company = Value of an unlevered company + Tax benefit

Or, $V_g = V_u + TB$

(ii) Cost of equity in a levered company $(K_{eg}) = K_{eu} + (K_{eu} - K_d) \frac{\text{Debt}(1-t)}{\text{Equity}}$

Where, K_{eg} = Cost of equity in a levered company

K_{eu} = Cost of equity in an unlevered company

K_d = Cost of debt

t = Tax rate

(iii) WACC in a levered company (K_{og})= K_{eu}(1-tL)

Where, K_{og} = WACC of a levered company

K_{eu} = Cost of equity in an unlevered company

t = Tax rate

$$L = \frac{\text{Debt}}{\text{Debt} + \text{Equity}}$$

Illustration 29*: When value of levered firm is more than the value of unlevered firm*

There are two company N Ltd. and M Ltd., having same earnings before interest and taxes i.e. EBIT of ₹ 20,000. M Ltd. is a levered company having a debt of ₹ 1,00,000 @ 7% rate of interest. The cost of equity of N Ltd. is 10% and of M Ltd. is 11.50%.

Find out how arbitrage process will be carried on?

Solution:

	Company	
	M Ltd.	N Ltd.
EBIT (NOI)	₹ 20,000	₹ 20,000
Debt (D)	₹ 1,00,000	---
K_e	11.50%	10%
K_d	7%	---

Value of equity (S) = $\frac{\text{NOI} - \text{Interest}}{\text{Cost of equity}}$

$$S_M = \frac{20,000 - 7,000}{11.50\%} = ₹\ 1,13,043$$

$$S_N = \frac{20,000}{10\%} = ₹\ 2,00,000$$

V_M = 1,13,043 + 1,00,000 {V = S + D} = ₹ 2,13,043

V_N = ₹ 2,00,000

Arbitrage Process:

If you have 10% shares of M Ltd., your value of investment in equity shares is 10% of ₹1,13,043 i.e. ₹ 11,304.30 and return will be 10% of (₹20,000 – ₹7,000) = ₹ 1,300.

Alternate Strategy will be:

Sell your 10% share of levered firm for ₹ 11,304.30 and borrow 10% of levered firms debt i.e. 10% of ₹ 1,00,000 and invest the money i.e. 10% in unlevered firms stock:

Total resources /Money we have = ₹11,304.30 + ₹10,000 = ₹21,304.3 and you invest 10% of ₹ 2,00,000 = ₹ 20,000

Surplus cash available with you is = ₹21,304.3 – ₹20,000 = ₹ 1,304.3

Your return = 10% EBIT of unlevered firm – Interest to be paid on borrowed funds

i.e. = 10% of ₹ 20,000 – 7% of ₹ 10,000 = ₹2,000 – ₹700 = ₹ 1,300

i.e. your return is same i.e. ₹ 1,300 which you are getting from N Ltd. before investing in M Ltd. But still you have ₹ 1,304.3 excess money available with you. Hence, you are better off by doing arbitrage.

Illustration 30*: When value of unlevered firm is more than the value of levered firm*

There are two companies U Ltd. and L Ltd., having same NOI of ₹ 20,000 except that L Ltd. is a levered company having a debt of ₹ 1,00,000 @ 7% and cost of equity of U Ltd. & L Ltd. are 10% and 18% respectively.

Show how arbitrage process will work.

Solution:

	Company	
	U Ltd.	L Ltd.
NOI	₹ 20,000	₹ 20,000
Debt capital	–	₹ 1,00,000
K_d	–	7%
K_e	10%	18%
Value of equity capital (s) = $\left(\frac{EBIT - Interest}{K_e}\right)$	₹ 2,00,000 $\left(\frac{20,000}{0.10}\right)$	₹ 72,222 $\left(\frac{20,000 - 7,000}{0.18}\right)$
Total value of the firm V = S + D	₹ 2,00,000	₹ 1,72,222 (₹ 72,222 + ₹1,00,000)

Assume you have 10% shares of unlevered firm i.e. investment of 10% of ₹ 2,00,000 = ₹ 20,000 and Return @ 10% on ₹ 20,000. Investment will be 10% of earnings available for

equity i.e. 10% × 20,000 = ₹ 2,000.

Alternative strategy:

Sell your shares in unlevered firm for ₹ 20,000 and buy 10% shares of levered firm's equity plus debt

i.e. 10% equity of levered firm	= 7,222
10% debt of levered firm	= 10,000
Total investment	= 17,222

Your resources are ₹ 20,000

Surplus cash available = Surplus – Investment = 20,000 – 17,222 = ₹ 2,778

Your return on investment is:

7% on debt of ₹ 10,000	700
10% on equity i.e. 10% of earnings available for equity holders i.e. (10% × 13,000)	1,300
Total return	2,000

i.e. in both the cases the return received is ₹ 2,000 and still you have excess cash of ₹ 2,778.

Hence, you are better off i.e you will start selling unlevered company shares and buy levered company's shares thereby pushing down the value of shares of unlevered firm and increasing the value of levered firm till equilibrium is reached.

Illustration 31: *One-third of the total market value of Sanghmani Limited consists of loan stock, which has a cost of 10 per cent. Another company, Samsui Limited, is identical in every respect to Sanghmani Limited, except that its capital structure is all-equity, and its cost of equity is 16 per cent. According to Modigliani and Miller, if we ignored taxation and tax relief on debt capital, what would be the cost of equity of Sanghmani Limited?*

Solution:

Here we are assuming that MM Approach 1958: Without tax, where capital structure has no relevance with the value of company and accordingly overall cost of capital of both levered as well as unlevered company is same. Therefore, the two companies should have similar WACCs. Because Samsui Limited is all-equity financed, its WACC is the same as its cost of equity finance, i.e. 16 per cent. It follows that Sanghmani Limited should have WACC equal to 16 per cent also.

Therefore, Cost of equity in Sanghmani Ltd. (levered company) will be calculated as follows:

$$K_o = \frac{2}{3} \times K_e + \frac{1}{3} \times K_d = 16\% \text{ (i.e. equal to WACC of Samsui Ltd.)}$$

$$\text{Or, } 16\% = \frac{2}{3} \times K_e + \frac{1}{3} \times 10\% \quad \text{Or, } K_e = 19$$

4.19 Over- Capitalisation and Under -Capitalisation

4.19.1 Over- Capitalisation: It is a situation where a firm has more capital than it needs or in other words assets are worth less than its issued share capital, and earnings are insufficient to pay dividend and interest. This situation mainly arises when the existing capital is not effectively utilized on account of fall in earning capacity of the company while company has raised funds more than its requirements. The chief sign of over-capitalisation is the fall in payment of dividend and interest leading to fall in value of the shares of the company.

Causes of Over-Capitalisation: Over-capitalisation arises due to following reasons:

(i) Raising more money through issue of shares or debentures than company can employ profitably.

(ii) Borrowing huge amount at higher rate than rate at which company can earn.

(iii) Excessive payment for the acquisition of fictitious assets such as goodwill etc.

(iv) Improper provision for depreciation, replacement of assets and distribution of dividends at a higher rate.

(v) Wrong estimation of earnings and capitalisation.

Consequences of Over-Capitalisation: Over-capitalisation results in the following consequences:

(i) Considerable reduction in the rate of dividend and interest payments.

(ii) Reduction in the market price of shares.

(iii) Resorting to "window dressing".

(iv) Some companies may opt for reorganization. However, sometimes the matter gets worse and the company may go into liquidation.

Remedies for Over-Capitalisation: Following steps may be adopted to avoid the negative consequences of over-capitalisation:

(i) Company should go for thorough reorganization.

(ii) Buyback of shares.

(iii) Reduction in claims of debenture-holders and creditors.

(iv) Value of shares may also be reduced. This will result in sufficient funds for the company to carry out replacement of assets.

4.19.2 Under Capitalisation: It is just reverse of over-capitalisation. It is a state, when its actual capitalisation is lower than its proper capitalisation as warranted by its earning capacity. This situation normally happens with companies which have insufficient capital but large secret reserves in the form of considerable appreciation in the values of the fixed assets not brought into the books.

Consequences of Under-Capitalisation: Under-capitalisation results in the following consequences:

(i) The dividend rate will be higher in comparison to similarly situated companies.

(ii) Market value of shares will be higher than value of shares of other similar companies because their earning rate being considerably more than the prevailing rate on such securities.

(iii) Real value of shares will be higher than their book value.

Effects of Under-Capitalisation: Under-capitalisation has the following effects:

(i) It encourages acute competition. High profitability encourages new entrepreneurs to come into same type of business.

(ii) High rate of dividend encourages the workers' union to demand high wages.

(iii) Normally common people (consumers) start feeling that they are being exploited.

(iv) Management may resort to manipulation of share values.

(v) Invite more government control and regulation on the company and higher taxation also.

Remedies: Following steps may be adopted to avoid the negative consequences of under capitalization:

(i) The shares of the company should be split up. This will reduce dividend per share, though EPS shall remain unchanged.

(ii) Issue of Bonus Shares is the most appropriate measure as this will reduce both dividend per share and the average rate of earning.

(iii) By revising upward the par value of shares in exchange of the existing shares held by them.

4.19.3 Over-Capitalisation vis-à-vis Under-Capitalisation: From the above discussion it can be said that both over capitalisation and under capitalisation are not good. However, over capitalisation is more dangerous to the company, shareholders and the society than under capitalisation. The situation of under capitalisation can be handled more easily than the situation of over-capitalisation. Moreover, under capitalisation is not an economic problem but a problem of adjusting capital structure. Thus, under capitalisation should be considered less dangerous but both situations are bad and every company should strive to have a proper capitalisation.

UNIT – III : BUSINESS RISK AND FINANCIAL RISK

Learning Objectives

After studying this chapter you will be able to:

- Define, discuss, and quantify "business risk" and "financial risk".
- Explain in detail operating and financial leverage and identify causes of both.
- Understand how to calculate and interpret a firm's leverage?
- Calculate a firm's operating break-even (quantity) point and break-even (sales) point
- Understand what is involved in determining the appropriate amount of financial leverage for a firm?

4.20 Introduction

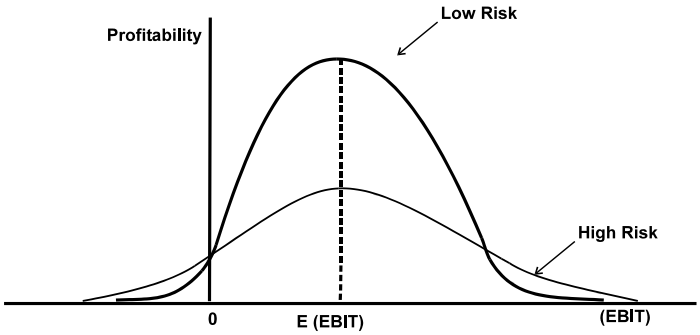
A firm can finance its operations through common and preference shares, with retained earnings, or with debt. Usually a firm uses a combination of these financing instruments. Capital structure refers to a firm's debt-to-equity ratio, which provides insight into how risky a company is Capital structure decisions by firms will have an effect on the expected profitability of the firm, the risks faced by debt holders and shareholders, the probability of failure, the cost of capital and the market value of the firm.

4.20.1 Business Risk and Financial Risk

Risk facing the common shareholders is of two types, namely business risk and financial risk. Therefore, the risk faced by common shareholders is a function of these two risks, i.e. {Business Risk, Financial Risk}

Business Risk:- It refers to the risk associated with the firm's operations. It is the uncertainty about the future operating income (EBIT), i.e. how well can the operating incomes be predicted?

Business risk can be measured by the standard deviation of the Basic Earning Power ratio.



Financial Risk:- It refers to the additional risk placed on the firm's shareholders as a result of

debt use i.e. the additional risk a shareholder bears when a company uses debt in addition to equity financing. Companies that issue more debt instruments would have higher financial risk than companies financed mostly or entirely by equity.

4.21 Debt versus Equity Financing

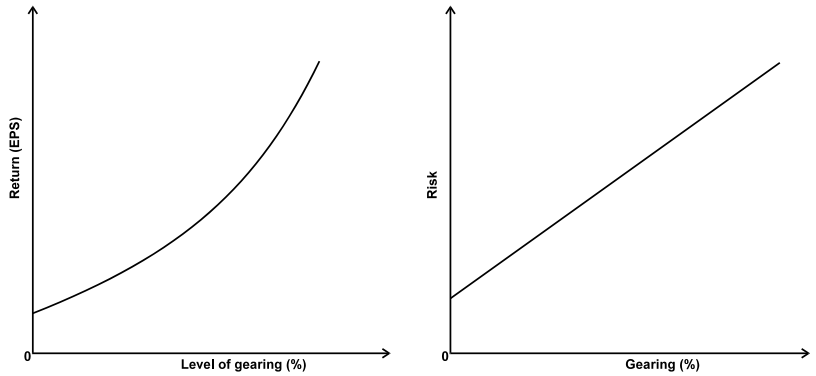
Financing a business through borrowing is cheaper than using equity. This is because:

- Lenders require a lower rate of return than ordinary shareholders. Debt financial securities present a lower risk than shares for the finance providers because they have prior claims on annual income and liquidation.
- A profitable business effectively pays less for debt capital than equity for another reason: the debt interest can be offset against pre-tax profits before the calculation of the corporate tax, thus reducing the tax paid.
- Issuing and transaction costs associated with raising and servicing debt are generally less than for ordinary shares.

These are some benefits from financing a firm with debt. Still firms tend to avoid very high gearing levels.

One reason is financial distress risk. This could be induced by the requirement to pay interest regardless of the cash flow of the business. If the firm goes through a rough period in its business activities it may have trouble paying its bondholders, bankers and other creditors their entitlement.

The relationship between Expected return (Earnings per share) and the level of gearing can be represented as:



Relationship between leverage and risk

Leverage can occur in either the *operating or financing* portions of the income statement.

The effect of leverage is to *magnify* the effects of changes in sales volume on earnings.

Let's now discuss in detail Operating, Financing and Combined Leverages.

4.22 Meaning and Types of Leverage

4.22.1 Meaning of Leverage: Leverage refers to the ability of a firm in employing long term funds having a fixed cost, to enhance returns to the owners. In other words, leverage is the amount of debt that a firm uses to finance its assets. A firm with a lot of debt in its capital structure is said to be highly levered. A firm with no debt is said to be unlevered.

The term Leverage in general refers to a relationship between two interrelated variables. In financial analysis it represents the influence of one financial variable over some other related financial variable. These financial variables may be costs, output, sales revenue, Earnings Before Interest and Tax (EBIT), Earning per share (EPS) etc.

4.22.2 Types of Leverage: There are three commonly used measures of leverage in financial analysis. These are:

(i) Operating Leverage

(ii) Financial Leverage

(iii) Combined Leverage

4.22.3 Chart Showing Operating Leverage, Financial Leverage and Combined leverage

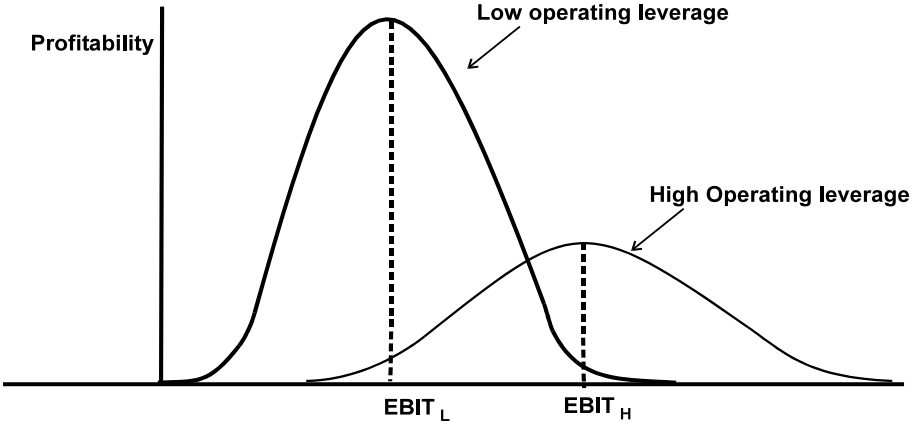
Profitability Statement		
Sales	xxx	
Less: Variable Cost	(xxx)	
Contribution	xxx	Operating Leverage; Combined Leverage
Less: Fixed Cost	(xxx)	
Operating Profit/ EBIT	xxx	Financial Leverage; Combined Leverage
Less: Interest	(xxx)	
Earnings Before Tax (EBT)	xxx	
Less: Tax	(xxx)	
Profit After Tax (PAT)	xxx	
Less: Pref. Dividend (if any)	(xxx)	
Net Earnings available to equity share holders/ PAT	xxx	
No. Equity shares (N)		
Earnings per Share (EPS) = (PAT ÷ N)		

4.22.3 Operating Leverage

Operating leverage (OL) maybe defined as the employment of an asset with a fixed cost in the hope that sufficient revenue will be generated to cover all the fixed and variable costs.

The use of assets for which a company pays a fixed cost is called operating leverage.

With fixed costs the percentage change in profits accompanying a change in volume is greater than the percentage change in volume. The higher the turnover of operating assets, the greater will be the revenue in relation to the fixed charge on those assets.



Operating leverage is a function of three factors:

(i) Rupee amount of fixed cost,

(ii) Variable contribution margin, and

(iii) Volume of sales.

$$\text{Operating Leverage (OL)} = \frac{\text{Contribution (C)}}{\text{Earnings before interest and tax (EBIT)}}$$

Where, Contribution (C) = Sales – Variable cost

EBIT = Sales- Variable cost – Fixed cost

4.22.4 Degree of Operating Leverage (DOL): The operating leverage may also be defined as "the firm's ability to use fixed operating cost to magnify the effects of changes in sales on its earnings before interest and taxes."

$$\text{Degree of Operating Leverage (DOL)} = \frac{\text{Percentage change in EBIT}}{\text{Percentage change in Sales}}$$

$$\text{Or,} \quad = \frac{\frac{\Delta \text{EBIT}}{\text{EBIT}}}{\frac{\Delta \text{Sales}}{\text{Sales}}}$$

Δ EBIT means changes in EBIT

Δ Sales means changes in sales

When DOL is more than one (1), operating leverage exists. More is the DOL higher is operating leverage.

Illustration 32: *A Company produces and sells 10,000 shirts. The selling price per shirt is ₹ 500. Variable cost is ₹ 200 per shirt and fixed operating cost is ₹ 25,00,000.*

(a) Calculate operating leverage.

(b) If sales are up by 10%, then what is the impact on EBIT?

Solution:

(a) Statement of Profitability

	(₹)
Sales Revenue (10,000 × 500)	50,00,000
Less: Variable Cost (10,000 × 200)	20,00,000
Contribution	30,00,000
Less: Fixed Cost	25,00,000
EBIT	5,00,000

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}} = \frac{30\text{ lakhs}}{5\text{ lakhs}} = 6\text{ times}$$

(b) Operating Leverage (OL) = $\frac{\%\text{ Change in EBIT}}{\%\text{ Change in Sales}}$

$$6 = \frac{x/5{,}00{,}000}{5{,}00{,}000/50{,}00{,}000}$$

x = 3,00,000

∴ ΔEBIT = 3,00,000/5,00,000

= 60%

Illustration 33: *Calculate the operating leverage for each of the four firms A, B, C and D from the following price and cost data:*

	Firms			
	A	*B*	*C*	*D*
	₹	*₹*	*₹*	*₹*
Sale price per unit	*20*	*32*	*50*	*70*
Variable cost per unit	*6*	*16*	*20*	*50*
Fixed operating cost	*80,000*	*40,000*	*2,00,000*	*Nil*

What calculations can you draw with respect to levels of fixed cost and the degree of operating leverage result? Explain. Assume number of units sold is 5,000.

Solution:

	Firms			
	A	B	C	D
Sales (units)	5,000	5,000	5,000	5,000
Sales revenue (Units × price) (₹)	1,00,000	1,60,000	2,50,000	3,50,000
Less: Variable cost	30,000	80,000	1,00,000	2,50,000
(Units × variable cost per unit) (₹)				
Less: Fixed operating costs (₹)	80,000	40,000	2,00,000	Nil
EBIT	(10,000)	40,000	(50,000)	1,00,000

$$DOL = \frac{\text{Current sales (S)} - \text{Variable costs (VC)}}{\text{Current EBIT}}$$

$$DOL_{(A)} = \frac{₹\ 1,00,000 - ₹\ 30,000}{₹\ 10,000} = 7$$

$$DOL_{(B)} = \frac{₹\ 1,60,000 - ₹\ 80,000}{₹\ 40,000} = 2$$

$$DOL_{(C)} = \frac{₹\ 2,50,000 - ₹\ 1,00,000}{₹\ 50,000} = 3$$

$$DOL_{(D)} = \frac{₹\ 3,50,000 - ₹\ 2,50,000}{₹\ 1,00,000} = 1$$

The operating leverage exists only when there are fixed costs. In the case of firm D, there is no magnified effect on the EBIT due to change in sales. A 20 per cent increase in sales has resulted in a 20 per cent increase in EBIT. In the case of other firms, operating leverage exists. It is maximum in firm A, followed by firm C and minimum in firm B. The interception of DOL of 7 is that 1 per cent change in sales results in 7 per cent change in EBIT level in the direction of the change of sales level of firm A.

4.22.5 Financial Leverage: Financial leverage (FL) maybe defined as 'the use of funds with a fixed cost in order to increase earnings per share.' In other words, it is the use of company funds on which it pays a limited return. Financial leverage involves the use of funds obtained at a fixed cost in the hope of increasing the return to common stockholders.

$$\text{Financial Leverage (FL)} = \frac{\text{Earnings before interest and tax (EBIT)}}{\text{Earnings before tax (EBT)}}$$

Where, EBIT = Sales- Variable cost – Fixed cost

EBT = EBIT - Interest

4.22.6 Degree of Financial Leverage (DFL): Degree of financial leverage is the ratio of the percentage increase in earnings per share (EPS) to the percentage increase in earnings before interest and taxes (EBIT). Financial Leverage (FL) is also defined as "the ability of a firm to use fixed financial charges to magnify the effect of changes in EBIT on EPS

$$\text{Degree of Financial Leverage(DFL)} = \frac{\text{Percentage change in earnings per share (EPS)}}{\text{Percentage change in earnigs before interest and tax (EBIT)}}$$

Or,

$$= \frac{\frac{\Delta EPS}{EPS}}{\frac{\Delta EBIT}{EBIT}}$$

Δ EPS means change in EPS and Δ EBIT means change in EBIT

When DFL is more than one (1), financial leverage exists. More is DFL higher is financial leverage.

4.22.7 Financial Leverage as 'Trading on Equity'.: Financial leverage indicates the use of funds with fixed cost like long term debts and preference share capital alongwith equity share capital which is known as trading on equity. The basic aim of financial leverage is to increase the earnings available to equity shareholders using fixed cost fund. A firm is known to have a positive leverage when its earnings are more than the cost of debt. If earnings is equal to or less than cost of debt, it will be an unfavourable leverage. When the quantity of fixed cost fund is relatively high in comparison to equity capital it is said that the firm is ''trading on equity".

4.22.8 Financial Leverage as a 'Double edged Sword'.: On one hand when cost of 'fixed cost fund' is less than the return on investment financial leverage will help to increase return on equity and EPS. The firm will be more than the return it will effect return of equity and EPS unfavourably and as a result firm can be under financial distress. This is why financial leverage is known as "double edged sword".

Effect on EPS and ROE:

When, ROI > Interest – Favourable – Advantage

When, ROI < Interest – Unfavourable – Disadvantage

When, ROI = Interest – Neutral – Neither advantage nor disadvantage.

Illustration 34*: Suppose there are two firms with the same operating leverage, business risk, and probability distribution of EBIT and only differ with respect to their use of debt (capital structure).*

Firm U	*Firm L*
No debt	*₹ 10,000 of 12% debt*
₹ 20,000 in assets	*₹ 20,000 in assets*
40% tax rate	*40% tax rate*

Solution:

Firm U: Unleveraged

	Economy		
	Bad	Avg.	Good
Probability	0.25	0.50	0.25
EBIT	₹ 2,000	₹ 3,000	₹ 4,000
Interest	0	0	0
EBIT	₹ 2000	₹ 3,000	₹ 4,000
Taxes (40%)	800	1,200	1,600
NI	₹ 1,200	₹ 1,800	₹ 2,400

Firm L: Leveraged

	Economy		
	Bad	Avg.	Good
Probability	0.25	0.50	0.25
EBIT	₹ 2,000	₹ 3,000	₹ 4,000
Interest	1,200	1,200	1,200
EBIT	₹ 800	₹ 1,800	₹ 2,800
Taxes (40%)	320	720	1,120
NI	₹ 480	₹1080	₹ 1,680

*Same as for Firm U.

Ratio comparison between leveraged and unleveraged firms

FIRM U	BAD	AVG.	GOOD
BEP(=EBIT/TOTAL ASSETS)	10.0%	15.0%	20.0%
ROE(=PAT/NETWORTH)	6.0%	9.0%	12.0%
TIE(INTEREST COVERAGE RATIO (=EBIT/INTEREST)	∞	∞	∞

FIRM L	Bad	Avg.	Good
BEP	10.0%	15.0%	20.0%

ROE	4.8%	10.8%	16.8%
TIE	1.67%	2.50%	3.30%

Risk and return for leveraged and unleveraged firms

Expected Values:

	Firm U	Firm L
E(BEP)	15.0%	15.0%
E(ROE)	9.0%	10.8%
E(TIE)	∞	2.5x

Risk Measures:

	Firm U	Firm L
σ_{ROE}	2.12%	4.24%
CV_{ROE}	0.24	0.39

Thus, the effect of leverage on profitability and debt coverage can be seen from the above example. For leverage to raise expected ROE, BEP must be greater than K_d i.e. BEP > K_d because if K_d > BEP, then the interest expense will be higher than the operating income produced by debt-financed assets, so leverage will depress income. As debt increases, TIE decreases because EBIT is unaffected by debt, and interest expense increases (Int Exp = K_d).

Thus, it can be concluded that the basic earning power (BEP) is unaffected by financial leverage. Firm L has higher expected ROE because BEP > K_d and it has much wider ROE (and EPS) swings because of fixed interest charges. Its higher expected return is accompanied by higher risk.

4.22.7 Combined Leverage: Combined leverage maybe defined as the potential use of fixed costs, both operating and financial, which magnifies the effect of sales volume change on the earning per share of the firm.

Combined Leverage (CL) = Operating Leverage (OL) × Financial Leverage (FL)

$$= \frac{C}{EBIT} \times \frac{EBIT}{EBT}$$

$$= \frac{C}{EBT}$$

4.22.8 Degree of Combined Leverage (DCL) : Degree of combined leverage (DCL) is the ratio of percentage change in earning per share to the percentage change in sales. It indicates the effect the sales changes will have on EPS.

DCL = DOL × DFL

$$= \frac{\%\,\text{Change in EBIT}}{\%\,\text{Change in Sales}} \times \frac{\%\,\text{Change in EPS}}{\%\,\text{Change in EBIT}}$$

$$= \frac{\%\,\text{Change in EPS}}{\%\,\text{Change in Sales}}$$

Illustration 35: *A firm's details are as under:*

Sales (@100 per unit)	*₹ 24,00,000*
Variable Cost	*50%*
Fixed Cost	*₹ 10,00,000*

It has borrowed ₹ 10,00,000 @ 10% p.a. and its equity share capital is ₹ 10,00,000 (₹ 100 each)

Calculate:

(a) Operating Leverage

(b) Financial Leverage

(c) Combined Leverage

(d) Return on Investment

(e) If the sales increases by ₹ 6,00,000; what will the new EBIT?

Solution:

	(₹)
Sales	24,00,000
Less: Variable cost	12,00,000
Contribution	12,00,000
Less: Fixed cost	10,00,000
EBIT	2,00,000
Less: Interest	1,00,000
EBT	1,00,000
Less: Tax (50%)	50,000
EAT	50,000
No. of equity shares	10,000
EPS	5

(a) Operating Leverage $= \frac{12,00,000}{2,00,000} = 6$ times

(b) Financial Leverage $= \frac{2,00,000}{1,00,000} = 2$ times

(c) Combined Leverage = OL × FL = 6 × 2 = 12 times.

(d) R.O.I $= \frac{50,000}{10,00,000} \times 100 = 5\%$

Here ROI is calculated as ROE i.e. $\frac{\text{EAT} - \text{Pref.Dividend}}{\text{Equity shareholders' fund}}$

(e) Operating Leverage = 6

$$6 = \frac{\Delta \text{EBIT}}{0.25}$$

$$\Delta \text{EBIT} = \frac{6 \times 1}{4} = 1.5$$

Increase in EBIT = ₹ 2,00,000 × 1.5 = ₹ 3,00,000

New EBIT = 5,00,000

Illustration 36: *Betatronics Ltd. has the following balance sheet and income statement information:*

Balance Sheet as on March 31st

Liabilities	*(₹)*	*Assets*	*(₹)*
Equity capital (₹ 10 per share)	*8,00,000*	*Net fixed assets*	*10,00,000*
10% Debt	*6,00,000*	*Current assets*	*9,00,000*
Retained earnings	*3,50,000*		
Current liabilities	*1,50,000*		
	19,00,000		*19,00,000*

Income Statement for the year ending March 31

	(₹)
Sales	*3,40,000*
Operating expenses (including ₹ 60,000 depreciation)	*1,20,000*
EBIT	*2,20,000*
Less: Interest	*60,000*
Earnings before tax	*1,60,000*
Less: Taxes	*56,000*
Net Earnings (EAT)	*1,04,000*

(a) Determine the degree of operating, financial and combined leverages at the current sales level, if all operating expenses, other than depreciation, are variable costs.

(b) If total assets remain at the same level, but sales (i) increase by 20 percent and (ii) decrease by 20 percent, what will be the earnings per share at the new sales level?

Solution:

(a) Calculation of Degree of Operating (DOL), Financial (DFL) and Combined leverages (DCL).

$$DOL = \frac{₹\ 3,40,000 - ₹\ 60,000}{₹\ 2,20,000} = 1.27$$

$$DFL = \frac{₹\ 2,20,000}{₹\ 1,60,000} = 1.38$$

DCL = DOL×DFL = 1.27×1.38 = 1.75

(b) Earnings per share at the new sales level

	Increase by 20%	Decrease by 20%
	(₹)	(₹)
Sales level	4,08,000	2,72,000
Less: Variable expenses	72,000	48,000
Less: Fixed cost	60,000	60,000
Earnings before interest and taxes	2,76,000	1,64,000
Less: Interest	60,000	60,000
Earnings before taxes	2,16,000	1,04,000
Less: Taxes	75,600	36,400
Earnings after taxes (EAT)	1,40,400	67,600
Number of equity shares	80,000	80,000
EPS	1.76	0.85

Working Notes:

(i) Variable Costs = ₹ 60,000 (total cost – depreciation)

(ii) Variable Costs at:

(a) Sales level, ₹ 4,08,000 = ₹ 72,000 (increase by 20%)

(b) Sales level, ₹ 2,72,000 = ₹ 48,000 (decrease by 20%)

Illustration 37: *Calculate the operating leverage, financial leverage and combined leverage from the following data under Situation I and II and Financial Plan A and B:*

Installed Capacity	*4,000 units*
Actual Production and Sales	*75% of the Capacity*

Selling Price	*₹ 30 Per Unit*
Variable Cost	*₹ 15 Per Unit*

Fixed Cost:

Under Situation I	*₹ 15,000*
Under Situation-II	*₹20,000*

Capital Structure:

	Financial Plan	
	A (₹)	*B (₹)*
Equity	*10,000*	*15,000*
Debt (Rate of Interest at 20%)	*10,000*	*5,000*
	20,000	*20,000*

Solution:

Operating Leverage:	Situation-I	Situation-II
	(₹)	(₹)
Sales (S)	90,000	90,000
3000 units @ ₹ 30/- per unit		
Less: Variable Cost (VC) @ ₹ 15 per unit	45,000	45,000
Contribution (C)	45,000	45,000
Less: Fixed Cost (FC)	15,000	20,000
Operating Profit (OP)	30,000	25,000
(EBIT)		

(i) *Operating Leverage*

$$\frac{C}{OP} = \quad ₹\ \frac{45,000}{30,000} \qquad ₹\ \frac{45,000}{25,000}$$

$$= \quad 1.5 \qquad 1.8$$

(ii) *Financial Leverages*

	A (₹)	B (₹)
Situation I		
Operating Profit (EBIT)	30,000	30,000

Less: Interest on debt	2,000	1,000
PBT	28,000	29,000

Financial Leverage = $\frac{OP}{PBT}$ = ₹ $\frac{30,000}{28,000}$ = 1.07 ₹ $\frac{30,000}{24,000}$ = 1.04

	A (₹)	B (₹)
Situation-II		
Operating Profit (OP)	25,000	25,000
(EBIT)		
Less: Interest on debt	2,000	1,000
PBT	23,000	24,000

Financial Leverage = $\frac{OP}{PBT}$ = ₹ $\frac{25,000}{23,000}$ = 1.09 ₹ $\frac{25,000}{24,000}$ = 1.04

(iii) *Combined Leverages*

	A	B
	(₹)	(₹)
(a) Situation I	1.5 x 1.07 =1.61	1.5 x 1.04 = 1.56
(b) Situation II	1.8 x 1.09 =1.96	1.8 x 1.04 =1.87

Illustration 38: *A company had the following Balance Sheet as on 31st March, 2014:*

Liabilities	*₹ (In crores)*	*Assets*	*(₹ In crores)*
Equity Share Capital (50 lakhs shares of ₹ 10 each)	*5*		
Reserves and Surplus	*1*	*Fixed Assets (Net)*	*12.5*
15% Debentures	*10*	*Current Assets*	*7.5*
Current Liabilities	*4*		
	20		*20*

The additional information given is as under:

Fixed cost per annum (excluding interest)	*₹ 4 crores*
Variable operating cost ratio	*65%*
Total assets turnover ratio	*2.5*
Income Tax rate	*30%*

Required:

Calculate the following and comment:

(i) Earnings Per Share

(ii) Operating Leverage

(iii) Financial Leverage

(iv) Combined Leverage

Solution:

Total Assets = ₹ 20 crores

Total Asset Turnover Ratio = 2.5

Hence, Total Sales = 20 × 2.5 = ₹ 50 crores

Computation of Profit after Tax (PAT)

	(₹ in crores)
Sales	50.00
Less: Variable Operating Cost @ 65%	32.50
Contribution	17.50
Less: Fixed Cost (other than Interest)	4.00
EBIT	13.50
Less: Interest on Debentures (15% × 10)	1.50
PBT	12.00
Less: Tax @ 30%	3.60
PAT	8.40

(i) Earnings per Share

$$EPS = \frac{8.40 \text{ crores}}{\text{Number of Equity Shares}}$$

$$= \frac{8.40 \text{ crores}}{50,00,000} = ₹ 16.80$$

It indicates the amount the company earns per share. Investors use this as a guide while valuing the share and making investment decisions. It is also a indicator used in comparing firms within an industry or industry segment.

(ii) Operating Leverage

$$\text{Operating Leverage} = \frac{\text{Contribution}}{\text{EBIT}}$$

$$= \frac{17.50}{13.50} = 1.296$$

It indicates the choice of technology and fixed cost in cost structure. It is level specific. When firm operates beyond operating break-even level, then operating leverage is low. It indicates sensitivity of earnings before interest and tax (EBIT) to change in sales at a particular level.

(iii) Financial Leverage

$$\text{Financial Leverage} = \frac{\text{EBIT}}{\text{PBT}} = \frac{13.50}{12.00} = 1.125$$

The financial leverage is very comfortable since the debt service obligation is small vis-à-vis EBIT.

(iv) Combined Leverage

$$\text{Combined Leverage} = \frac{\text{Contribution}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{PBT}}$$

Or, = Operating Leverage × Financial Leverage

$= 1.296 \times 1.125 = 1.458$

The combined leverage studies the choice of fixed cost in cost structure and choice of debt in capital structure. It studies how sensitive the change in EPS is vis-à-vis change in sales. The leverages – operating, financial and combined are measures of risk.

SUMMARY

1. Cost of Capital: In simple terms Cost of capital refers to the discount rate that is used in determining the present value of the estimated future cash proceeds of the business/new project and eventually deciding whether the business/new project is worth undertaking or now. It is also the minimum rate of return that a firm must earn on its investment which will maintain the market value of share at its current level. It can also be stated as the opportunity cost of an investment, i.e. the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected
2. Components of Cost of Capital: In order to calculate the specific cost of each type of capital, recognition should be given to the explicit and the implicit cost. The cost of capital can be either explicit or implicit. The explicit cost of any source of capital may be defined

as the discount rate that equals that present value of the cash inflows that are incremental to the taking of financing opportunity with the present value of its incremental cash outflows. Implicit cost is the rate of return associated with the best investment opportunity for the firm and its shareholders that will be foregone if the project presently under consideration by the firm was accepted.

3. Measurement of Specific Cost of Capital for each source of Capital: The first step in the measurement of the cost of the capital of the firm is the calculation of the cost of individual sources of raising funds. From the viewpoint of capital budgeting decisions, the long term sources of funds are relevant as they constitute the major sources of financing the fixed assets. In calculating the cost of capital, therefore the focus on long-term funds and which are:-

   Long term debt (including Debentures)

   Preference Shares

   Equity Capital

   Retained Earnings

4. Weighted Average Cost of Capital:- WACC (weighted average cost of capital) represents the investors' opportunity cost of taking on the risk of putting money into a company. Since every company has a capital structure i.e. what percentage of funds comes from retained earnings, equity shares, preference shares, debt and bonds, so by taking a weighted average, it can be seen how much cost/interest the company has to pay for every rupee it borrows/invest. This is the weighted average cost of capital.

5. Capital Structure and Its Factors: Capital structure refers to the mix of a firm's capitalisation (i.e. mix of long term sources of funds such as debentures, preference share capital, equity share capital and retained earnings for meeting total capital requirment). Capital Structure decision refers to deciding the forms of financing (which sources to be tapped), their actual requirements (amount to be funded) and their relative proportions (mix) in total capitalisation. Normally a finance manager tries to choose a pattern of capital structure which minimises cost of capital and maximises the owners' return. Well, while choosing a suitable financing pattern, certain factors like cost, risk, control, flexibility and other considerations like nature of industry, competition in the industry etc. should be considered. For e.g. Industries facing severe competition also resort to more equity than debt.

6. Leverage (Operating and Financial):- Operating leverage exists when a firm has a fixed cost that must be defrayed regardless of volume of business. It can be defined as the firm's ability to use fixed operating costs to magnify the effects of changes in sales on its earnings before interest and taxes. Financial leverage involves the use fixed cost of

financing and refers to mix of debt and equity in the capitalisation of a firm. Financial leverage is a superstructure built on the operating leverage. It results from the presence of fixed financial charges in the firm's income stream.

7. Combined Leverage:- Combined leverage maybe defined as the potential use of fixed costs, both operating and financial, which magnifies the effect of sales volume change on the earning per share of the firm. Degree of combined leverage (DCL) is the ratio of percentage change in earning per share to the percentage change in sales. It indicates the effect the sales changes will have on EPS.

8. Optimal Capital Structure (EBIT-EPS Analysis): The basic objective of financial management is to design an appropriate capital structure which can provide the highest earnings per share (EPS) over the firm's expected range of earnings before interest and taxes (EBIT). PS measures a firm's performance for the investors. The level of EBIT varies from year to year and represents the success of a firm's operations. EBIT-EPS analysis is a vital tool for designing the optimal capital structure of a firm. The objective of this analysis is to find the EBIT level that will equate EPS regardless of the financing plan chosen.

9. Capital Structure Theories:- The following approaches explain the relationship between cost of capital, capital structure and value of the firm:

   a. Net income approach

   b. Net operating income approach

   c. Modigliani-Miller approach

   d. Traditional approach.

APPENDIX

Future value interest factor of ₹1 per period at i% for n periods, FVIF(i,n).

(The Compound Sum of One Rupee)

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100
2	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188	1.210
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727
25	1.282	1.641	2.094	2.666	3.386	4.292	5.427	6.848	8.623	10.835
30	1.348	1.811	2.427	3.243	4.322	5.743	7.612	10.063	13.268	17.449
35	1.417	2.000	2.814	3.946	5.516	7.686	10.677	14.785	20.414	28.102
40	1.489	2.208	3.262	4.801	7.040	10.286	14.974	21.725	31.409	45.259
50	1.645	2.692	4.384	7.107	11.467	18.420	29.457	46.902	74.358	117.391

Contd…….

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.190	1.200
2	1.232	1.254	1.277	1.300	1.323	1.346	1.369	1.392	1.416	1.440
3	1.368	1.405	1.443	1.482	1.521	1.561	1.602	1.643	1.685	1.728
4	1.518	1.574	1.630	1.689	1.749	1.811	1.874	1.939	2.005	2.074
5	1.685	1.762	1.842	1.925	2.011	2.100	2.192	2.288	2.386	2.488
6	1.870	1.974	2.082	2.195	2.313	2.436	2.565	2.700	2.840	2.986
7	2.076	2.211	2.353	2.502	2.660	2.826	3.001	3.185	3.379	3.583
8	2.305	2.476	2.658	2.853	3.059	3.278	3.511	3.759	4.021	4.300
9	2.558	2.773	3.004	3.252	3.518	3.803	4.108	4.435	4.785	5.160
10	2.839	3.106	3.395	3.707	4.046	4.411	4.807	5.234	5.695	6.192
11	3.152	3.479	3.836	4.226	4.652	5.117	5.624	6.176	6.777	7.430
12	3.498	3.896	4.335	4.818	5.350	5.936	6.580	7.288	8.064	8.916
13	3.883	4.363	4.898	5.492	6.153	6.886	7.699	8.599	9.596	10.699
14	4.310	4.887	5.535	6.261	7.076	7.988	9.007	10.147	11.420	12.839
15	4.785	5.474	6.254	7.138	8.137	9.266	10.539	11.974	13.590	15.407
16	5.311	6.130	7.067	8.137	9.358	10.748	12.330	14.129	16.172	18.488
17	5.895	6.866	7.986	9.276	10.761	12.468	14.426	16.672	19.244	22.186
18	6.544	7.690	9.024	10.575	12.375	14.463	16.879	19.673	22.901	26.623
19	7.263	8.613	10.197	12.056	14.232	16.777	19.748	23.214	27.252	31.948
20	8.062	9.646	11.523	13.743	16.367	19.461	23.106	27.393	32.429	38.338
25	13.585	17.000	21.231	26.462	32.919	40.874	50.658	62.669	77.388	95.396
30	22.892	29.960	39.116	50.950	66.212	85.850	111.065	143.371	184.675	237.376
35	38.575	52.800	72.069	98.100	133.176	180.314	243.503	327.997	440.701	590.668
40	65.001	93.051	132.782	188.884	267.864	378.721	533.869	750.378	1,051.668	1,469.772
50	184.565	289.002	450.736	700.233	1,083.657	1,670.704	2,566.215	3,927.357	5,988.914	9,100.438

Present value interest factor of Re 1 per period at i% for n periods, PVIF(i,n).

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149
25	0.780	0.610	0.478	0.375	0.295	0.233	0.184	0.146	0.116	0.092
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057
35	0.706	0.500	0.355	0.253	0.181	0.130	0.094	0.068	0.049	0.036
40	0.672	0.453	0.307	0.208	0.142	0.097	0.067	0.046	0.032	0.022
50	0.608	0.372	0.228	0.141	0.087	0.054	0.034	0.021	0.013	0.009

Contd….

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	0.812	0.797	0.783	0.769	0.756	0.743	0.731	0.718	0.706	0.694
3	0.731	0.712	0.693	0.675	0.658	0.641	0.624	0.609	0.593	0.579
4	0.659	0.636	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.593	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.482	0.452	0.425	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.233
9	0.391	0.361	0.333	0.308	0.284	0.263	0.243	0.225	0.209	0.194
10	0.352	0.322	0.295	0.270	0.247	0.227	0.208	0.191	0.176	0.162
11	0.317	0.287	0.261	0.237	0.215	0.195	0.178	0.162	0.148	0.135
12	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.232	0.205	0.181	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.209	0.183	0.160	0.140	0.123	0.108	0.095	0.084	0.074	0.065
16	0.188	0.163	0.141	0.123	0.107	0.093	0.081	0.071	0.062	0.054
17	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.138	0.116	0.098	0.083	0.070	0.060	0.051	0.043	0.037	0.031
20	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026
25	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010
30	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004
35	0.026	0.019	0.014	0.010	0.008	0.006	0.004	0.003	0.002	0.002
40	0.015	0.011	0.008	0.005	0.004	0.003	0.002	0.001	0.001	0.001
50	0.005	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.000	0.000

Future value interest factor of an ordinary annuity of Re 1 per period at i% for n periods, FVIFA(i,n). (The Compound Value of an Annuity of One Rupee)

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.010	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100
3	3.030	3.060	3.091	3.122	3.153	3.184	3.215	3.246	3.278	3.310
4	4.060	4.122	4.184	4.246	4.310	4.375	4.440	4.506	4.573	4.641
5	5.101	5.204	5.309	5.416	5.526	5.637	5.751	5.867	5.985	6.105
6	6.152	6.308	6.468	6.633	6.802	6.975	7.153	7.336	7.523	7.716
7	7.214	7.434	7.662	7.898	8.142	8.394	8.654	8.923	9.200	9.487
8	8.286	8.583	8.892	9.214	9.549	9.897	10.260	10.637	11.028	11.436
9	9.369	9.755	10.159	10.583	11.027	11.491	11.978	12.488	13.021	13.579
10	10.462	10.950	11.464	12.006	12.578	13.181	13.816	14.487	15.193	15.937
11	11.567	12.169	12.808	13.486	14.207	14.972	15.784	16.645	17.560	18.531
12	12.683	13.412	14.192	15.026	15.917	16.870	17.888	18.977	20.141	21.384
13	13.809	14.680	15.618	16.627	17.713	18.882	20.141	21.495	22.953	24.523
14	14.947	15.974	17.086	18.292	19.599	21.015	22.550	24.215	26.019	27.975
15	16.097	17.293	18.599	20.024	21.579	23.276	25.129	27.152	29.361	31.772
16	17.258	18.639	20.157	21.825	23.657	25.673	27.888	30.324	33.003	35.950
17	18.430	20.012	21.762	23.698	25.840	28.213	30.840	33.750	36.974	40.545
18	19.615	21.412	23.414	25.645	28.132	30.906	33.999	37.450	41.301	45.599
19	20.811	22.841	25.117	27.671	30.539	33.760	37.379	41.446	46.018	51.159
20	22.019	24.297	26.870	29.778	33.066	36.786	40.995	45.762	51.160	57.275
25	28.243	32.030	36.459	41.646	47.727	54.865	63.249	73.106	84.701	98.347
30	34.785	40.568	47.575	56.085	66.439	79.058	94.461	113.28	136.31	164.49
35	41.660	49.994	60.462	73.652	90.320	111.43	138.24	172.32	215.71	271.02
40	48.886	60.402	75.401	95.026	120.80	154.76	199.64	259.06	337.88	442.59
50	64.463	84.579	112.80	152.67	209.35	290.34	406.53	573.77	815.08	1,163.9

Contd….

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180	2.190	2.200
3	3.342	3.374	3.407	3.440	3.473	3.506	3.539	3.572	3.606	3.640
4	4.710	4.779	4.850	4.921	4.993	5.066	5.141	5.215	5.291	5.368
5	6.228	6.353	6.480	6.610	6.742	6.877	7.014	7.154	7.297	7.442
6	7.913	8.115	8.323	8.536	8.754	8.977	9.207	9.442	9.683	9.930
7	9.783	10.089	10.405	10.730	11.067	11.414	11.772	12.142	12.523	12.916
8	11.859	12.300	12.757	13.233	13.727	14.240	14.773	15.327	15.902	16.499
9	14.164	14.776	15.416	16.085	16.786	17.519	18.285	19.086	19.923	20.799
10	16.722	17.549	18.420	19.337	20.304	21.321	22.393	23.521	24.709	25.959
11	19.561	20.655	21.814	23.045	24.349	25.733	27.200	28.755	30.404	32.150
12	22.713	24.133	25.650	27.271	29.002	30.850	32.824	34.931	37.180	39.581
13	26.212	28.029	29.985	32.089	34.352	36.786	39.404	42.219	45.244	48.497
14	30.095	32.393	34.883	37.581	40.505	43.672	47.103	50.818	54.841	59.196
15	34.405	37.280	40.417	43.842	47.580	51.660	56.110	60.965	66.261	72.035
16	39.190	42.753	46.672	50.980	55.717	60.925	66.649	72.939	79.850	87.442
17	44.501	48.884	53.739	59.118	65.075	71.673	78.979	87.068	96.022	105.93
18	50.396	55.750	61.725	68.394	75.836	84.141	93.406	103.74	115.27	128.12
19	56.939	63.440	70.749	78.969	88.212	98.603	110.28	123.41	138.17	154.74
20	64.203	72.052	80.947	91.025	102.44	115.38	130.03	146.63	165.42	186.69
25	114.41	133.33	155.62	181.87	212.79	249.21	292.10	342.60	402.04	471.98
30	199.02	241.33	293.20	356.79	434.75	530.31	647.44	790.95	966.71	1,181.9
35	341.59	431.66	546.68	693.57	881.17	1,120.7	1,426.5	1,816.7	2,314.2	2,948.3
40	581.83	767.09	1,013.7	1,342.0	1,779.1	2,360.8	3,134.5	4,163.2	5,529.8	7,343.9
50	1,668.8	2,400.0	3,459.5	4,994.5	7,217.7	10,436	15,090	21,813	31,515	45,497

Present value interest factor of an (ordinary) annuity of Re 1 per period at i% for n periods, PVIFA(i,n).

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514
25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077
30	25.808	22.396	19.600	17.292	15.372	13.765	12.409	11.258	10.274	9.427
35	29.409	24.999	21.487	18.665	16.374	14.498	12.948	11.655	10.567	9.644
40	32.835	27.355	23.115	19.793	17.159	15.046	13.332	11.925	10.757	9.779
50	39.196	31.424	25.730	21.482	18.256	15.762	13.801	12.233	10.962	9.915

Contd….

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192
11	6.207	5.938	5.687	5.453	5.234	5.029	4.836	4.656	4.486	4.327
12	6.492	6.194	5.918	5.660	5.421	5.197	4.988	4.793	4.611	4.439
13	6.750	6.424	6.122	5.842	5.583	5.342	5.118	4.910	4.715	4.533
14	6.982	6.628	6.302	6.002	5.724	5.468	5.229	5.008	4.802	4.611
15	7.191	6.811	6.462	6.142	5.847	5.575	5.324	5.092	4.876	4.675
16	7.379	6.974	6.604	6.265	5.954	5.668	5.405	5.162	4.938	4.730
17	7.549	7.120	6.729	6.373	6.047	5.749	5.475	5.222	4.990	4.775
18	7.702	7.250	6.840	6.467	6.128	5.818	5.534	5.273	5.033	4.812
19	7.839	7.366	6.938	6.550	6.198	5.877	5.584	5.316	5.070	4.843
20	7.963	7.469	7.025	6.623	6.259	5.929	5.628	5.353	5.101	4.870
25	8.422	7.843	7.330	6.873	6.464	6.097	5.766	5.467	5.195	4.948
30	8.694	8.055	7.496	7.003	6.566	6.177	5.829	5.517	5.235	4.979
35	8.855	8.176	7.586	7.070	6.617	6.215	5.858	5.539	5.251	4.992
40	8.951	8.244	7.634	7.105	6.642	6.233	5.871	5.548	5.258	4.997
50	9.042	8.304	7.675	7.133	6.661	6.246	5.880	5.554	5.262	4.999